MASTER BUILDERS

Developers and Manufacturers
of Products for Improving Concrete

GENTHER, D. A.

PRICE SCHEDULE

EFFECTIVE APRIL 1, 1961

NOTICE

Price subject to change without notice.

These prices are for shipment from our factories in standard size containers. Prices for material delivered from local warehouse will be adjusted to include transportation, warehousing and handling.

This price list covers shipment within the United States only. Please refer all inquiries for prices outside U.S.A. to the Foreign Sales Section, The Master Builders Company, Cleveland 18, Ohio; in Canada to The Master Builders Company Limited, 95 Ingram Drive, Toronto 15, Ontario.

THE MASTER BUILDERS COMPANY
Division of the American-Marietta Company
Cleveland 18, Ohio

POZZOLITH (50 Lb. Bags)	Factory Designation	Am't Used Per Bag Of Cement	5000# or More	Up To 5000#	F.O.B. Factory
POZZOLITH (NORMAL)	3	¼ Lb.	$.42 Lb.	$.44 Lb.	Cleveland, O.
POZZOLITH RETARDER	3R	¼ Lb.	$.42 Lb.	$.44 Lb.	Cleveland, O.
POZZOLITH HIGH EARLY	3HE	½ Lb.	$.26 Lb.	$.28 Lb.	Cleveland, O.

EMBECO	Carload	10,000# to Carload	2100# Up to 10,000#	Up to 2100#	F.O.B. Factory
Ready-to-use					
EMBECO PRE-MIXED MORTAR:					
100 Lb. Bags	$.07 Lb.	$.07½ Lb.	$.08 Lb.	$.08½ Lb.	Buffalo, N.Y.
70 Lb. Steel Pails	.10	.10½	.11	.11½	Buffalo, N.Y.
EMBECO PRE-MIXED GROUT:					
100 Lb. Bags	$.08 Lb	$.08½ Lb.	$.09 Lb.	$.09½ Lb.	Buffalo, N.Y.
100 Lb. Steel Pails	.10½	.11	.11½	.12	Buffalo, N.Y.
With ⅜" Aggregate 100 Lb. Bags	.08	.08½	.09	.09½	Buffalo, N.Y.
Job-Mixed					
(100 Lb. Bags)					
EMBECO AGGREGATE*	$.11 Lb.	$.11½ Lb.	$.12 Lb.	$.12½ Lb.	Buffalo, N.Y.
EMBECO No. 2, 3 & 5*	.12	.12½	.13	.13½	Buffalo, N.Y.

METALLIC WATER-PROOFING* 100 Lb. Bags	$.12 Lb.		$.13 Lb.	$.13½ Lb.	Buffalo, N.Y.
RUST JOINT IRON* 100 Lb. Bags	$.11 Lb.	$.11½ Lb.	$.12 Lb.	$.12½ Lb.	Buffalo, N.Y.

*These products are also packaged in: 100 Lb. steel pails-add $.03 per pound.

MASTERPLATE (100 Lb. Bags)	Carload	10,000# to Carload	2100# Up to 10,000#	Up to 2100#	F.O.B. Factory
METALLIC AGGREGATE					
Non-Colored	$.13 Lb.	$.13½ Lb.	$.14 Lb.	$.14½ Lb.	Buffalo, N.Y.
Tile Red and Persian Red	.13½	.14	.14½	.15	Buffalo, N.Y.
Other standard colors except Nile Green, Tan & French Gray	.15	.15½	.16	.16½	Buffalo, N.Y.
NON-METALLIC AGGREGATE					
Nile Green	$.27 Lb.	$.27½ Lb.	$.28 Lb.	$.28½ Lb.	Cleveland, O.
Tan	.15½	.16	.16½	.17	Cleveland, O.
French Gray	.12½	.13	.13½	.14	Cleveland, O.

COLORCRON (100 Lb. Bags)*					
Non-Colored	$.09 Lb.	$.09½ Lb.	$.10 Lb.	$.10½ Lb.	Cleveland, O.
Nile Green	.23	.23½	.24	.24½	Cleveland, O.
Other standard colors	.12½	.13	.13½	.14	Cleveland, O.

*Colorcron also available in 50 Lb. bags. Add 1¢ per pound.

METALICRON (100 Lb. Bags)					
Non-Colored	$.09½ Lb	$.10 Lb.	$.10½ Lb	$.11 Lb.	Buffalo, N.Y.

COLORMIX (50 Lb. Bags)	Amount Used Per Bag of Cement	Per Pound All Quantities	F.O.B. Factory
Nile Green	10 Lbs.	1.18	Cleveland, O.
French Gray	10 Lbs.	.45	Cleveland, O.
Other colors	5 Lbs.	.45	Cleveland, O.

SANISEAL	400# Bbl.	50# Carton	10 and 15# Carton	F.O.B. Factory
No. 50	$.49 Lb.	$ .51 Lb.	$.53 Lb.	Cleveland, O.
No. 100	.47	.49	.51	Cleveland, O.
No. 200	.41	.43	.45	Cleveland, O.

MASTERQUICK	Carload	10,000# to Carload	2100# Up to 10,000#	Up to 2100#	F.O.B. Factory
100 Lb. Steel Pails	$.18 Lb.	$.19 Lb.	$.20 Lb.	$.21 Lb.	Buffalo, N.Y.

KUROWAX	30 Lb. Pail	7 Lb. Pail	F.O.B. Factory
Clear	$ .90 Lb.	$1.00 Lb.	Cleveland, O.
Nile Green	1.55	1.65	Cleveland, O.
Other colors	1.15	1.25	Cleveland, O.

MASTERKURE No. 2	55 Gal. Drum	5 Gal. Pail	1 Gal. Pail	F.O.B. Factory
	$3.25 Gal.	$3.50 Gal.	$3.60 Gal.	Cleveland, O.

OMICRON MORTAR-PROOFING	Am't Used Per Bag of Cement	10,000 Lbs. or More	Up to 10,000 Lbs.	F.O.B. Factory
50 Lb. Bags	1 Lb.	$.12 Lb.	$.13 Lb.	Cleveland, O.

STEAROX (10 Lb. & 50 Lb Bags)	Amount Used Per Bag of Cement	Per Pound All Quanties	F.O.B. Factory
No. 100 (Increases Air Slightly)	0.2 Lb.	$.60 Lb.	Cleveland, O.
LL 125 (Non-Air Entraining)	0.2 Lb.	.68	Cleveland, O.

CONCRETE DATA
ON
MASTER BUILDERS PRODUCTS FOR IMPROVING CONCRETE

Fourth Edition — 1961

For over 50 years — the mark of quality for concrete

MASTER BUILDERS®

THE MASTER BUILDERS CO.
Div. of American-Marietta Co.
Cleveland 18, Ohio

THE MASTER BUILDERS CO., LTD.
Sub. of American-Marietta Co.
Toronto 15, Ontario

Represented In Foreign Countries By:
MASTER BUILDERS INTERNATIONAL
Div. of American-Marietta, C. A.
Nassau, Bahamas

— World Wide Service And Manufacturing Facilities —

MASTER BUILDERS RESEARCH AND TECHNICAL CENTER dedicated to the search for more knowledge of material to control the behavior of concrete. Since its founding in 1909, The Master Builders Company has pioneered in research and development of products and methods for improving user's control of the qualities and economies of concrete and mortar.

Printed in U.S.A.

FOREWORD

The unexcelled performance of Master Builders' materials is the result of both the products themselves and their methods of use. These products and methods have developed from a background of a half-century of experience in the field of concrete and mortar.

This handbook contains much valuable information about Master Builders products as well as how and where they should be used. The information is condensed for quick reference and does not constitute complete manufacturer's specifications. Complete literature, specifications and documentary evidence to support all statements are available on request.

MEASUREMENTS USED

Weight and volume measurements are given in U.S. units, and the 94-pound bag of cement is used. The following conversion factors are applicable for Imperial and Metric units:

U.S.	IMPERIAL (Canada)	METRIC
1 pound	1 pound	0.454 kilograms
1 gallon	0.833 Imperial gallons	3.785 liters
1 bag cement (94 lbs.)	1.07 Canadian bags (87½ lbs.)	42.7 kilograms

PRODUCT-USE DIRECTIONS

In general, directions for the use of Master Builders products are based on the use of well-designed concrete or mortar, with air and material temperatures of 60° to 80° F., and with other conditions normal unless otherwise noted. Consult your Master Builders field man for detailed directions on using Master Builders products under these normal conditions and under abnormal conditions such as excessively high or low temperatures, high winds, slow or rapid drying, soft or off-graded aggregates, etc. Experienced Master Builders field men are located in all principal cities to assist you with any problem related to concrete and mortar.

MASTER BUILDERS SERVICE

Technical products for improving the quality of concrete and mortar are complex chemical compounds with a wide range of benefits, secured through adaptation of the formulations and method of use to meet specific job conditions. The specification writer and user, therefore, must rely on competent field service, as provided by the manufacturer, to assure effective use of these technical products . . . under varying job-site conditions.

SERVICE AVAILABLE FROM MASTER BUILDERS

For over 50 years, The Master Builders Company has made the following services available to specification writers and users of our products:

PROPER PRODUCT SELECTION: Your local Master Builders man can discuss with you, in your office or on the telephone, any of your concrete problems and the Master Builders product or procedure recommended as a solution. On request, he will confirm his recommendation by letter, including suggested specification clauses covering the problem discussed.

INFORMATION ON CONCRETE MATERIALS: Your Master Builders man has working knowledge of local job conditions and concrete materials. As part of a network of over 150 field men, he also has quick access to similar information for your jobs throughout the country, in Canada and for most foreign countries . . . qualities of concrete materials, typical mix designs, performance data, climatic and special related conditions.

ON-THE-JOB SERVICE: You may request the presence of a field man on the job in the early stages of the project to assure maximum benefits whenever Master Builders products are being used — with job-site materials — under job conditions. There is no charge for this service. Job service reports are supplied upon request.

Your local Master Builders man is a trained, competent concrete specialist. He is conversant with concrete problems and can frequently supply reference literature. When your problem is unusually complex, he receives expert assistance from The Master Builders Engineering and Research Staff, unexcelled in our industry.

We look on your specification and use of Master Builders products as a responsibility to do whatever is necessary to provide you maximum benefits at the job site.

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INTEGRAL TREATMENTS FOR CONCRETE:

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CONCRETE FLOOR HARDENING AND COLOR TREATMENTS

INTRODUCTION

The usefulness of a building depends upon its floors, for they invariably are the part subjected to the greatest wear.

What properties should a concrete floor have? They may include any or all of the following: abrasion resistance ... impact resistance ... corrosion resistance ... slip resistance. The desired degree of each property is determined by the type of traffic that will travel over the floor or the work that will be done on it.

In addition to physical requisites, colorful appearance may be a factor that will add much to attractiveness and very little to installation costs.

In plain concrete floors, several of the above physical properties are present to such a small degree that even the best concrete is frequently termed by many "not good enough". Ample evidence is provided by the pitted, ravelled, worn-out floors in thousands of structures of all types.

Master Builders' treatments for concrete floors are designed to correct such conditions in existing buildings and to prevent them in new structures. Several of these treatments also provide colorful "eye appeal", thus combining beauty with utility.

COLOR CHART
MASTER BUILDERS FLOOR PRODUCTS

Color of the finished floor is subject to some variation depending on the color of the cement and aggregate in the mix over which the product is applied . . . also depending on finishing technique and length of curing.

All products may not be available in all colors . . . see product discussions on following pages.

BATTLESHIP GRAY

SEAL BROWN

TERRA COTTA

TILE RED

FRENCH GRAY

TAN

PERSIAN RED

CORAL GABLES BEIGE

MAROON

NILE GREEN

Also Available in BLACK

ANVIL-TOP

All-Iron Aggregate Floor Topping for Extra Heavy-Duty Protection against Impact and Abrasion

DESCRIPTION:

*Anvil-Top** is specially formulated and processed for exclusive use as an iron aggregate-portland cement topping of ½" to 1" thickness. *Anvil-Top* is a ready-to-use material complete in one package; only water need be added on the job. Generally, the *Anvil-Top* mix is placed (1) as a topping over worn concrete that is structurally sound and properly prepared, or (2) over fresh concrete as a 2-course floor.

Thick ANVIL-TOP surface assures lasting protection against impact and abrasion.

WHERE USED:

Anvil-Top "all-iron aggregate" floor topping is designed to withstand extremely heavy impact and abrasion. It affords extra heavy-duty floor protection heretofore found only in 1" steel plates costing much more. It is designed for "key" floor areas which receive a greater concentration or frequency of traffic and production; which must be capable of withstanding extremely heavy impact and abrasion; and which are in vital areas where it is impossible to shut down for sufficient time for adequate repairs using plain concrete. Such key areas include loading platforms, main aisles, areas in front of elevators and processing machines, overhead crane loading zones, etc.

ADVANTAGES OF THE *ANVIL-TOP* FLOOR:

1. IMPACT-RESISTANT AND WEAR-RESISTANT: *Anvil-Top* is composed of all-iron aggregate. This accurately graded and specially processed ground iron aggregate imparts a ductile yet high strength quality to the surface and the entire thickness of *Anvil-Top.* This ductile quality together with extremely high flexural strength, enables *Anvil-Top* to withstand tremendous impact and shock without crushing. *Anvil-Top* is 4 to 8 times more abrasion-resistant than plain concrete, and this abrasion-resistance continues throughout the thickness of *Anvil-Top* resulting in a serviceable life of at least 15 times greater than plain concrete. Therefore, *Anvil-Top* is superior to natural aggregate floors, which fracture under impact and abrasion; and to steel plates, which curl under impact, presenting a hazard to workmen and equipment.

2. HIGH EARLY FLEXURAL AND COMPRESSIVE STRENGTH: *Anvil-Top* develops over 6,000 psi compressive strength and over 500 psi flexural strength in 1 day under normal conditions of temperature and humidity. These qualities in themselves are enough to warrant the use of *Anvil-Top*

**Registered trademark.*

in any key areas which may only be shut down from 24 to 48 hours for floor repairs. At seven days, *Anvil-Top* develops 11,000 psi compressive and over 1,000 psi flexural strengths. These exceptionally high strengths combined with the ductile quality of the iron aggregate enable *Anvil-Top* to withstand tremendous point loads and the shock of heavy impact when properly placed over a structurally sound slab.

3. NON-DUSTING: Ductile metal aggregate bound in a properly cured high strength cement binder overcomes the problem of dusting.

ANVIL-TOP resists wear in key traffic areas.

4. LOW ABSORPTION AND CORROSION-RESISTANT: *Anvil-Top* has extremely low absorption, and will withstand oil, grease and many corrosive solutions.

5. EASY TO CLEAN: *Anvil-Top,* with its smooth, low absorbent surface, free from pits and ruts, is easy to clean, and stands up well under steam cleaning, strong cleaning compounds and mechanical sweepers.

6. SLIP-RESISTANT: By swirl trowelling the surface, thereby setting the iron particles on edge, a slip-resistant surface is obtained. The slip-resistant finish is made of ridges of "reinforced concrete" which are considerably more durable than the brittle ridges of plain concrete.

7. LONG-RANGE ECONOMY: More and more plants are realizing the economy of specifying industrial floors on the basis of long term investment rather than initial cost. *Anvil-Top* is actually more economical than plain concrete floors in key areas, due to its longer life and extra heavy-duty floor protection. Add to this the reduction in shut-down

time, accidents, maintenance and damage to production goods, plus increased life of material handling equipment, and *Anvil-Top* becomes a very economical investment. In addition, floors surfaced with *Anvil-Top* are quiet under traffic and will not buckle; and there are no protruding dangerous joints to hinder foot and wheel traffic.

8. EASY TO INSTALL: *Anvil-Top* is placed in much the same manner as a good dry-tamped concrete topping. It is ready-to-use; only water need be added at the job site. Floors surfaced with *Anvil-Top* can be installed by contractors or those plant maintenance people who follow good concrete placing and finishing practices or who are willing to follow such sound practices when supplied with the proper information. When Master Builders' recommendations for water content are followed, uniform mixing, placing and finishing characteristics can be maintained. Also, a definite water-cement ratio is obtained which makes possible the high strengths *Anvil-Top* is designed to produce. A Master Builders man must be present initially to render service on these jobs.

ESTIMATING DATA:

10 pounds of *Anvil-Top* per square foot produces a ½" thick floor topping. 20 pounds of *Anvil-Top* per square foot produces a 1" thick floor topping. Under no circumstances should less than ½" thickness be employed.

PACKAGING:

100 lb. moisture resistant cloth bags.

FREIGHT CLASSIFICATION:

Iron Borings, Ground, Not Powdered.

STANDARD SPECIFICATION:

The floor areas designated as heavy duty key areas in the plans or elsewhere in the specifications shall be constructed with *Anvil-Top* as manufactured by The Master Builders Company and used in strict accordance with their directions. A field service representative of The Master Builders Company shall be present for the installation. The installer shall consult with the field representative on proper use of the product. The *Anvil-Top* shall be applied to a thickness of (indicate thickness) inches. When the *Anvil-Top* installation is over fresh concrete, concrete in base slab shall be compact and level, allowing for thickness of *Anvil-Top* to obtain required finished floor level. When *Anvil-Top* installation is over new or old hardened concrete, the surface of the base slab shall be structurally sound, made rough, clean, and free of laitance, at a grade sufficiently lower to accommodate the thickness of *Anvil-Top.*

DIRECTIONS:

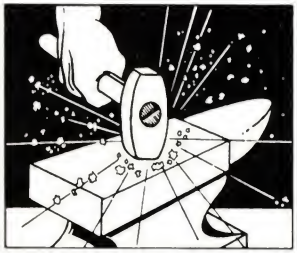
See your Master Builders man for complete instructions.

Non-Colored MASTERPLATE

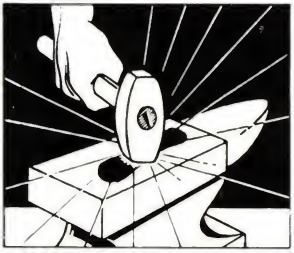
Specially Prepared Metallic Aggregate for Producing "Iron-Armoured" Concrete Floors of Greater Wear Resistance

DESCRIPTION:

*Masterplate** is specially prepared metallic aggregate—tough, ductile, specially processed and size-graded iron—combined with Master Builders' water-reducing agent and other exclusive technical components which improve the properties of the finished floor. It is mixed with portland cement (2 parts *Masterplate* to 1 part cement, by weight) at the job site, and the dry mixture is dusted over the surface of freshly floated concrete, floated into the surface and trowelled to the desired finish. *Masterplate* is packaged and delivered to the job *free of rust* . . . a unique feature of Master Builders' experienced, exclusive manufacturing process.



Plain concrete is brittle; fractures under impact.



The iron in MASTERPLATE is ductile; withstands impact.

WHERE USED:

In the surfacing and hardening of new floors, either monolithically or two-course, and for resurfacing old concrete floors. (See Directions, for resurfacing old concrete.) For producing heavy-duty "iron-armoured" concrete floors.

ADVANTAGES OF *MASTERPLATE*:

1. EXCLUSIVE TECHNICAL COMPONENTS IN *MASTERPLATE*: These exclusive technical components, which include Master Builders' time-tested cement-dispersing agent, serve to extend the available moisture at the surface of the slab, making it possible to incorporate 1 lb. or more of *Masterplate* per square foot of floor. Without these components it is difficult to embed more than 0.6 lb. of iron aggregate per square foot and keep it at the surface. The technical components assure high compressive strength and a thick ductile surface—the two basic qualities for long floor life.

2. PROPER GRADATION: The optimum gradation of *Masterplate* assures an interlocking of iron particles with a minimum amount of cement paste to hold the particles in the surface. This results in greater wear-resistance and freedom from dusting.

**Registered trademark.*

3. PURITY: *Masterplate* is made with clean, rust free, oil-free water-absorbent iron, free of non-ferrous metallic material. It bonds firmly with the cement paste — does not react with the alkali to produce gases which would lead to blistering and scaling. Absence of rust on the *Masterplate* aggregate means a sounder surface and greater resistance to oxidation than cheap iron aggregate with rust already developing on the iron particles.

4. FIELD SERVICE: The user of *Masterplate* benefits from the counsel and recommendations regarding proper application technique. On the job service rendered by experienced, full-time Master Builders field men. is available at no charge, when requested, at the start of the floor work to aid in adjusting the application procedure to special job conditions.

Comparative wear of adjoining floors after eight years. Plain concrete (left) badly worn. MASTERPLATE (right) still in good condition.

ADVANTAGES OF THE *MASTERPLATE* FLOOR:

1. WEAR-RESISTANT: The aggregate in plain concrete is brittle, and fractures under impact and abrasion. *Masterplate* is ductile under impact —produces a metallic finish that wears as much as 8 times longer than the best plain concrete. (See Bureau of Standards Report 1252 and ACI Vol. 50-18.) *Masterplate* is more wear-resistant than the best plain concrete, high-strength topping, the hardest of natural aggregates, chemical surface treatments or cheap metallic hardeners which are not refined to the same extent and quality that is possible in our own modern manufacturing plants.

2. NON-DUSTING: Ductile metal aggregate bound in a properly cured high strength cement binder overcomes the problem of dusting.

3. LOW ABSORPTION AND CORROSION-RESISTANT: *Masterplate* has extremely low absorption, making it almost impossible for oil, grease and corrosive solutions to penetrate the surface. Materials spilled on *Masterplate* remain on the surface where they may be easily removed.

4. SLIP-RESISTANT (When Desired): By swirl trowelling the surface, thereby setting the iron particles on edge, a slip-resistant surface is obtained. The slip-resistant finish is made of ridges of "reinforced concrete" which are far more durable than ridges made of plain concrete.

5. EASY TO CLEAN: *Masterplate,* with its smooth, low absorbent surface, free from shrinkage cracks, pits and ruts, is easy to clean and stands up well under steam cleaning, strong cleaning compounds and mechanical sweepers.

6. ECONOMICAL: The wear-resisting qualities, low initial cost and negligible maintenance costs of *Masterplate* produce the most economical floor surface known to industry today.

NON-COLORED *MASTERPLATE*

ESTIMATING DATA:

1¼ lbs. of Non-Colored *Masterplate* per square foot produces a heavy duty "iron-armoured" concrete floor (one-eighth inch armor plating). 1 lb. per square foot produces a moderate to heavy duty floor.

PACKAGING:

100 lb. moisture resistant cloth bags.

FREIGHT CLASSIFICATION:

Iron Borings, Ground, Not Powdered.

STANDARD SPECIFICATION:

Into the surface of all concrete floors (as indicated) shall be incorporated a mixture consisting of 2 parts of Non-Colored *Masterplate* and 1 part portland cement by weight, using (insert quantity) pounds of *Masterplate* per square foot, in strict accordance with the directions of the manufacturer, The Master Builders Company.

RELATED PRODUCTS:

MASTERKURE*—Membrane curing compound for curing floors surfaced with Non-Colored *Masterplate.*

ANVIL-TOP*—All-iron aggregate floor topping for extra heavy-duty protection.

DIRECTIONS:

Monolithic Method:

1. PLACE, COMPACT & SCREED— In mixing the concrete for the slab, use as little water as possible to produce a plastic consistency of 2

to 4 inch slump. Distribute concrete evenly to the approximate final floor level. Compact and screed, filling in low spots until it becomes a level mass. Use only a wood bull float or wood darby. Do not overwork the surface.

Correcting For Excessive Bleeding:

Do not use cement or a cement-sand mixture to absorb bleeding water. Should concrete bleed excessively, removal of water by dragging surface with rubber hose, burlap, or similar method is suggested.

2. FLOAT— Fill all voids and hollows in floor, using wood darby,

wood bull float, or mechanical float with a disc or blades.

3. PREPARE SHAKE — Mix together dry until uniform in color 2 bags *Masterplate* and 1 bag standard Type I portland cement.

**Registered trademark.*

This dry mix is sufficient for 160 sq. ft. of heavy-duty floor (1¼ lbs. *Masterplate* per sq. ft.) or 200

sq. ft. of moderate to heavy-duty floor (1 lb. *Masterplate* per sq. ft.). Apply the mix in two separate shakes, using one-half of mixture for each shake.

4. APPLY FIRST SHAKE—As soon as there is no free water on the surface, distribute the first shake evenly, in a uniform pattern, work-

ing small areas at a time. Bend low and let the material sift through the fingers. Do not throw it, as throwing causes the material to segregate. Throwing can be avoided by bridging the slab.

5. FLOAT FIRST SHAKE — Allow the shake to wet thoroughly and float with a mechanical disc or bladed float. If the surface will not support a heavy disc float, float the shake by hand or by use of a trowelling machine equipped with float blades in flat position.

Never add water to the surface to assist in floating. The moisture must come to the surface through the shake to assure bond. Do not overwork.

6. APPLY SECOND SHAKE — Immediately after floating the first

shake, apply the second shake, as in Operation 4.

7. FLOAT SECOND SHAKE—As soon as moisture begins to come

through, float the second shake, as in Operation 5.

8. FIRST STEEL TROWELLING— When sheen has disappeared, follow with a flat steel trowelling,

NON-COLORED *MASTERPLATE*

either by hand or with a mechanical trowel. Trowel must be kept flat. Do not over-trowel.

9. SECOND STEEL TROWELLING —When the surface has stiffened to a point where no additional

water or fines will be brought to the surface, follow with a second steel trowelling, raising the trowel to produce a smooth finish.

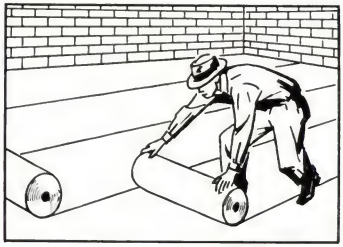
Slip-Resistant Finish:

Where a slip-resistant finish is desired, after the first steel trowelling (Operation 8), go over the area with mechanical disc float with hammers, or give the surface a swirled finish by flat trowelling, using a circular motion, bringing the iron up in fine ridges. Only slight ridges are desirable and necessary. Do not raise deep ridges.

10. CURE—As soon as the surface has hardened sufficiently so that it will not be marred by the application, and before the surface has dried out, apply one coat of Master Builders *MasterKure* membrane curing compound. Apply with a

soft bristle brush or by spray, as uniformly as possible.

11. PROTECT — Cover the floor with scuff-proof building paper, overlapped two or three inches to



protect the surface from plaster and paint droppings and marring by other trades, until floor is to be put into service.

Topping Method:

1. Apply a topping of 1″ minimum thickness to a new or "green" base slab. Prepare a mix using (by weight):

1 part standard portland cement;
1 ½ parts clean concrete sand;
1½ parts hard pea gravel or stone, graded from ⅛″ to ⅜″;
with approximately 4½ gallons of water per bag of cement.

Note: If local aggregates produce a harsh mix, the above pro-

portions should be varied to secure a workable mix. Maintain a 1 to 3 ratio of cement to aggregate.

2. If the concrete in the base slab has not taken its initial set, a bond coat is not required. If it has taken initial set, scrub into the surface a slush bond coat of standard portland cement with a stiff bristled broom. Time this operation so that the bond coat will not set or dry out before the topping mortar is placed.

3. Place, rake, level, compact and screed the topping.

4. Float the surface to compact the topping mortar and to bring moisture to the surface. Use only a wood float or wood darby.

5. Continue with Operations 3 to 11 as outlined in the Monolithic (One-Course) Method.

Resurfacing Old Floors or Topping Set Slabs:

(*Caution:* Do not attempt to resurface slabs that are not structurally sound.)

1. The entire surface of old or set slab should be roughened with a bush hammer, jack hammer or mechanical scarifying equipment. Thoroughly clean and flush the surface. Saturate with clean water continuously for 24 hours prior to application of topping.

2. Scrub a slush bond coat of standard portland cement into the roughened surface with a stiff bristle broom. Time this operation so that the bond coat will not dry out or set before the topping mortar is placed.

3. Design and place the topping mortar with a minimum of 1″ thickness, as outlined in the Topping (Two-Course) Method.

PRECAUTIONS:

1. The directions given above are based on job and material temperatures of 60° F to 90° F. For abnormal conditions, such as high or low temperatures, high winds, hot sun, low humidity, poorly graded aggregates, or where the use of air-entrained concrete cannot be avoided, consult your nearest Master Builders man for detailed directions on using the product under these conditions. Master Builders branch offices are located in all principal cities.

2. Non-Colored *Masterplate* should be used with standard portland cement, Type I (ASTM Specification C-150), in preference to air-entraining portland cement—both in preparing the shake and in the fresh concrete over which the *Masterplate* is applied. If air-entraining cement is used in the concrete, the entrained air content should be less than 3%. The shake should not be floated into the surface until the concrete has stiffened somewhat, and the surface should not be overworked by excessive floating and trowelling. (See Master Builders Technical Bulletin No. 16.)

3. A membrane curing compound (see *MasterKure)* must be applied as soon as the surface has hardened sufficiently so as not to be marred by the application. Early curing is of the utmost importance, especially during high temperatures or where areas are exposed to the sun. Use of spray permits earliest possible application.

4. Avoid the use of chloride in concrete over which *Masterplate* is applied. During cold weather, heating the mix or working in a heated area is recommended in order to avoid retarded hardening and retarded strength gains.

Colored MASTERPLATE

Specially Prepared Metallic Aggregate for Producing Colored "Iron-Armoured" Floors of Great Wear Resistance

DESCRIPTION:

Colored *Masterplate** is specially prepared metallic aggregate—tough, ductile, specially processed and size-graded iron—combined with stable superfine light-fast coloring pigments, Master Builders' water-reducing agent and other exclusive technical components which improve the properties of the finished floor. It is mixed with portland cement (2 parts *Masterplate* to 1 part cement by weight) at the job site. The dry mixture is dusted over the surface of freshly floated concrete, floated into the surface and trowelled to the desired finish. (See page 18 for Colored *Masterplate* made with non-metallic aggregate for special use under conditions where metallic aggregate is not necessary). *Masterplate* is packaged and delivered to the job *free of rust* . . . a unique feature of Master Builders experienced, exclusive manufacturing process.

Colored MASTERPLATE combines warmth with durability and promotes good housekeeping.

WHERE USED:

In the hardening and coloring of new floors, either monolithically or two-course, and for resurfacing old concrete floors. (See Directions, below, for resurfacing old concrete.) For producing long-wearing "iron-armoured" surfaces of uniform color.

ADVANTAGES OF COLORED *MASTERPLATE:*

1. EXCLUSIVE TECHNICAL COMPONENTS IN COLORED *MASTERPLATE:*

These exclusive technical components, which include Master Builders'

**Registered trademark.*

time-tested cement-dispersing agent, extend the available moisture at the surface of the slab, making it possible to incorporate 1 lb. or more of *Masterplate* per square foot. Without these components it is difficult to embed more than 0.6 lb. of iron aggregate per square foot and keep it at the surface. These technical components assure high compressive strength and a thick ductile surface — the two basic qualities for long floor life.

2. PROPER GRADATION: The optimum gradation of Colored *Masterplate* assures an interlocking of iron particles with a minimum amount of cement paste to hold the particles in the surface. This results in greater wear-resistance and freedom from dusting.

3. PURITY: Colored *Masterplate* is made with clean, rust-free, oil-free water absorbent iron, free of non-ferrous metallic material. It bonds firmly with the cement paste—does not react with the alkali to produce gases which would lead to blistering and scaling. Rust-free iron aggregate is particularly important in obtaining attractively colored floors. The absence of rust on the *Masterplate* aggregate also means a sounder surface and greater resistance to oxidation than cheap iron aggregate with rust already developed on the iron particles.

4. LIGHT-FAST AND ALKALI-FAST PIGMENTS: Only the best, finely ground, light-fast and alkali-fast inorganic oxides are used in manufacturing Colored *Masterplate.* Master Builders' exclusive technical components increase the intensity of the color.

5. FIELD SERVICE: The user of Colored *Masterplate* benefits from counsel and recommendations regarding proper application technique. On-the-job service rendered by experienced, full-time Master Builders field men, is available at no charge, when requested, at the start of the floor work to aid in adjusting the application procedure to special job conditions.

ADVANTAGES OF COLORED *MASTERPLATE* FLOORS:

1. LOW COST: The most economical type of heavy-duty, wear-resistant colored floor. Costs less than keeping floor painted — eliminates inconvenience and costly interruptions for repainting floors from which paint has peeled and worn off.

2. ATTRACTIVE: "Built-in" warmth and beauty of colored tile for little more than the cost of plain concrete floors. After hardening, they can be economically scored to many pleasing patterns with a power saw fitted with a carborundum wheel.

3. WEAR-RESISTANT: Up to eight times more wear-resistant than the best plain concrete floor.

4. UNIFORM COLOR: Uniform color, extending throughout the depth of the iron surface . . . lasts the life of the floor. Complements industrial color dynamics to mark off traffic aisles, danger areas, etc., and promotes good housekeeping.

5. NON-DUSTING: Ductile metallic aggregate bound in a properly cured high strength cement binder overcomes the problem of dusting.

COLORED *MASTERPLATE*

6. SLIP-RESISTANT: By swirl trowelling the surface, thereby setting iron particles on edge, a slip-resistant surface is obtained. The slip-resistant finish is made of ridges of "reinforced concrete".

7. LOW MAINTENANCE: Easy and inexpensive to maintain—only regular cleaning and periodic waxing with *Kurowax* are required to maintain an excellent appearance.

COLORS:

Tile Red	Seal Brown	Maroon
Persian Red	Terra Cotta	Battleship Gray
Black		

(See Color Chart, Page 2)

(Nile Green, Tan and French Gray are made with non-metallic aggregate. Coral Gables Beige is not available as *Masterplate* — see page 18.)

ESTIMATING DATA:

1¼ lbs. of Colored *Masterplate* per square foot produces a heavy-duty "iron-armoured" colored concrete floor. 1 lb. per square foot produces a moderate to heavy-duty floor.

PACKAGING:

100 lb. moisture resistant cloth bags.

FREIGHT CLASSIFICATION:

Iron Borings, Ground, Not Powdered.

STANDARD SPECIFICATION:

Into the surface of all concrete floors (as indicated) shall be incorporated a mixture consisting of 2 parts of (insert color) Colored *Masterplate* and 1 part portland cement by weight, using (insert quantity) pounds of Colored *Masterplate* per square foot, in strict accordance with the directions of the manufacturer, The Master Builders Company.

RELATED PRODUCTS:

KUROWAX*—Curing and maintenance wax in colors to match those of Colored *Masterplate.*

COLORCRON*—Colored, ready-to-use, non-metallic dust-on material.

DIRECTIONS:

Monolithic Method:

1. PLACE, COMPACT & SCREED—In mixing the concrete for the slab, use as little water as possible to produce a plastic consistency of 2 to 4 inch slump. Distribute concrete evenly to the approximate final floor level. Compact and screed, filling in low spots until it

**Registered trademark.*

becomes a level mass. Use only a wood bull float or wood darby. Do not overwork the surface.

Correcting For Excessive Bleeding: Do not use cement or a cement-sand mixture to absorb bleeding water. Should concrete bleed excessively, removal of water by dragging surface with rubber hose, burlap, or similar method is suggested.

2. FLOAT — Fill all voids and hollows in floor, using wood

darby, wood bull float, or mechanical float with blades or a disc.

3. PREPARE SHAKE — Mix together dry until uniform in color

2 bags *Masterplate* and 1 bag standard Type I portland cement. This dry mix is sufficient for 160 sq. ft. of heavy-duty floor (1¼ lbs. *Masterplate* per sq. ft.) or 200 sq. ft. of moderate to heavy-duty floor (1 lb. *Masterplate* per sq. ft.). Apply the mix in two separate shakes, using one-half of mixture for each shake.

4. APPLY FIRST SHAKE—As soon as there is no free water on the surface, distribute the first shake evenly, in a uniform pattern, working small areas at a time. Bend low and let the material sift through the fingers. Do not throw it, as

throwing causes the material to segregate. Throwing can be avoided by bridging the slab.

5. FLOAT FIRST SHAKE—Allow the shake to wet thoroughly and float with a mechanical bladed or disc float. If the surface will not

support a heavy disc float, float the shake by hand or by use of a

trowelling machine equipped with float blades in a flat position. *Never* add water to the surface to assist in floating. The moisture must come to the surface through the shake to assure bond. Do not overwork.

6. APPLY SECOND SHAKE —

Immediately after floating the first shake, apply the second shake, as in Operation 4.

7. FLOAT SECOND SHAKE—As soon as moisture begins to come

through, float the second shake, as in Operation 5.

8. FIRST STEEL TROWELLING — When sheen has disappeared, follow with a flat steel trowelling, either by hand or with a mechanical trowel. Trowel must be kept flat. Do not over-trowel nor burnish trowel.

9. SECOND STEEL TROWELLING —When the surface has stiffened to a point where no additional water or fines will be brought to the surface, follow with a second steel trowelling, raising the trowel to produce a smooth finish. *Do not burnish.*

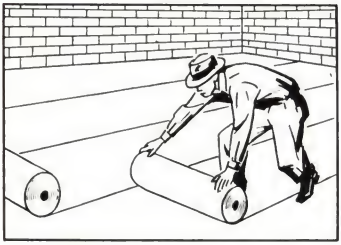
Slip-Resistant Finish:

Where a slip-resistant finish is desired, after the first steel trowelling (Operation 8), go over the area with a mechanical disc float with hammers, or give the surface a swirled finish by flat trowelling, using a circular motion, bringing the iron up in fine ridges. Only slight ridges are desirable and necessary. Do not raise deep ridges.

10. CURE AND WAX—As soon as the surface is hard enough not to be marred by the application, and

before the surface has dried out, apply a coat of Master Builders *Kurowax,* the same color as the floor *(Kurowax* cures and waxes in the same operation.) Use a *mohair* roller coater to apply the *Kurowax* thinly and uniformly.

11. PROTECT — Cover the dried



Kurowax surface with scuff-proof building paper, overlapped two or three inches, to protect the surface from plaster and paint droppings and marring by other trades.

12. CLEAN AND POLISH—When floor is to be put into service,

remove paper and wash the floor. Let dry. Polish with electric polisher with soft bristles, or with weighted polishing brush.

Topping Method: (Two-Course)

1. Apply a topping of 1″ minimum thickness to a new or "green" base slab. Prepare a mix using (by weight):

1 part standard portland cement;
1 ½ parts clean concrete sand;
1½ parts hard pea gravel or stone, graded from ⅛″ to ⅜″; with approximately 4½ gallons of water per bag of cement.

Note: If local aggregates produce a harsh mix, the above proportions should be varied to secure a workable mix. Maintain a 1 to 3 ratio of cement to aggregate.

2. If the concrete in the base slab has not taken its initial set, a bond coat is not required. If it has taken initial set, scrub into the surface a slush bond coat of standard portland cement with a stiff bristled broom Time this operation so that the bond coat will not set or dry out before the topping mortar is placed.

3. Place, rake, level, compact and screed the topping.

4. Float the surface to compact the topping mortar and to bring moisture to the surface. Use only a wood float or wood darby.

5. Continue with Operations 3 to 11 as outlined in the Monolithic (One-Course) Method.

Resurfacing Old Floors or Topping Set Slabs:

(*Caution:* Do not attempt to resurface slabs that are not structurally sound.)

1. The entire surface of old or set slab should be roughened with a bush hammer, jack hammer, or mechanical scarifying equipment. Thoroughly clean and flush the surface. Saturate with clean water continuously for 24 hours prior to application of topping.

COLORED *MASTERPLATE*

2. Scrub a slush bond coat of standard portland cement into the roughened surface with a stiff bristle broom. Time this operation so the bond coat will not dry out or set before the topping mortar is placed.

3. Design and place the topping mortar with a minimum of 1″ thickness, as outlined in the Topping (Two-Course) Method.

PRECAUTIONS:

1. The directions given above are based on job and material temperatures of 60° F to 90° F. For abnormal conditions, such as high or low temperatures, high winds, hot sun, low humidity, poorly graded aggregates, or where the use of air-entrained concrete cannot be avoided, consult your nearest Master Builders man for detailed directions on using the product under these conditions. Master Builders branch offices are located in all principal cities.

2. Colored *Masterplate* should be used with standard portland cement, Type I (ASTM Specification C-150), in preference to air-entraining portland cement—both in preparing the shake and in the fresh concrete over which the *Masterplate* is applied. If air-entraining cement is used in the concrete, the entrained air content should be less than 3%. The shake should not be floated into the surface until the concrete has stiffened somewhat, and the surface should not be overworked through excessive floating and trowelling. (See Master Builders Technical Bulletin No. 16.)

3. A curing compound (see *Kurowax)* must be applied as soon as the surface has hardened sufficiently so as not to be marred by the application. Early curing is of the utmost importance, especially during high temperatures or where areas are exposed to the sun.

4. Avoid the use of chlorides in concrete over which *Masterplate* is applied. During cold weather, heating the mix or working in a heated area is recommended in order to avoid retarded hardening and retarded strength gains.

COLORED *MASTERPLATE* WITH NON-METALLIC AGGREGATE:

Colored *Masterplate* in Nile Green, Tan and French Gray is made with non-metallic aggregate. The other standard colors of Colored *Masterplate* (see Color Chart) can also be manufactured, on request, in the non-metallic formulation, for special use under conditions where metallic aggregate is not necessary. (See also *Colorcron* — non-metallic, ready-to-use floor hardener.)

Colored *Masterplate* with non-metallic aggregate is tough, wear-resisting, well-graded silica aggregate, combined with stable super-fine light-fast coloring pigments, Master Builders' water-reducing agent and other exclusive technical components which improve the properties of the finished floor.

Colored *Masterplate* with non-metallic aggregate is mixed with portland cement (4 parts *Masterplate* to 3 parts cement by weight) at the job site. The dry mixture is dusted over the surface of freshly floated concrete, of a rate of 0.6 pounds of Colored *Masterplate* per square foot and is floated into the surface and trowelled to the desired finish, in the same manner as Colored *Masterplate* with metallic aggregate.

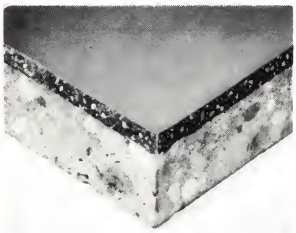
See your Master Builders man for complete information.

Ready-4-Use MASTERPLATE

Ready-to-Use Metallic Dust-Coat Material for Producing "Iron-Armoured" Concrete Floors With Greater Wear Resistance

DESCRIPTION:

Ready-4-Use *Masterplate** is an iron-aggregate dust-coat material, colored or non-colored, which provides all the service advantages of standard *Masterplate,* with the additional advantage that all ingredients are tested, proportioned, combined and packaged at the factory and delivered to the job ready-to-apply, with no further additions or mixing. The materials in this formulation consist of tough, ductile, specially processed and size-graded iron, a specially tested and selected cement binder combined in correct proportion with Master Builders' water-reducing agent and other exclusive technical components which improve the properties of the finished floor. *Masterplate* is packaged and delivered to the job *free of rust* . . . a unique feature of Master Builders experienced, exclusive manufacturing process.



MASTERPLATE surface increases concrete floor life 4 to 8 times.

Only the best, finely ground light-fast and alkali-fast inorganic oxides are used in manufacturing Colored Ready-4-Use *Masterplate.* Master Builders' exclusive technical components increase the intensity of the color.

ADVANTAGES OF READY-4-USE *MASTERPLATE* OVER JOB-MIXED HARDENERS:

Use of Ready-4-Use *Masterplate* reduces to a minimum job site errors that can damage efficiency of the floor and endanger the owner's investment. By handling under factory control steps previously left to the skill and convenience of job site labor and supervision, Ready-4-Use *Masterplate* brings the "iron-armoured" concrete floor surface four steps nearer to the finished product:

1. Factory tested and selected cement of the proper type is used, eliminating this as a variable.

2. Factory proportioning assures two parts of aggregate to one part cement. A reversal of this formula by carelessness on the job would produce a floor with poor wearing quality.

3. Factory mixing of all materials assures proper and uniform distribution of cement and also prevents contamination of the materials in the job-mixing process.

4. There is greater assurance that the correct amount of shake for a given area is used.

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READY-4-USE *MASTERPLATE*

COLORS:

Tile Red | Persian Red | Non-Colored

(See Color Chart, Page 2)

(Non-metallic aggregate ready-to-use dust-on materials are available in a full line of standard colors. See *Colorcron**.)

ESTIMATING DATA:

180 lbs. of Ready-4-Use *Masterplate* per 100 sq. ft. will produce a heavy-duty "iron-armoured" concrete floor.

120 lbs. of Ready-4-Use *Masterplate* per 100 sq. ft. will produce a moderate to heavy-duty floor.

PACKAGING:

90 lb. polyethylene lined moisture resistant cloth bags.

FREIGHT CLASSIFICATION:

Iron Borings, Ground, Not Powdered.

STANDARD SPECIFICATION:

Into the surface of all concrete floors (as indicated) shall be incorporated (insert color) Ready-4-Use *Masterplate,* using (insert quantity) pounds of Ready-4-Use *Masterplate* per square foot, in strict accordance with the directions of the manufacturer, The Master Builders Company.

RELATED PRODUCTS:

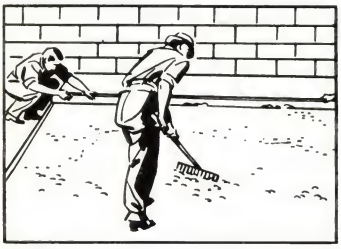
MASTERKURE*—Membrane curing compound for curing floors surfaced with Non-Colored Ready-4-Use *Masterplate.*

KUROWAX*-Curing and maintenance wax in colors to match those of Colored Ready-4-Use *Masterplate.*

DIRECTIONS:

Monolithic Method:

1. PLACE, COMPACT & SCREED— In mixing the concrete for the



slab, use as little water as possible to produce a plastic consistency of 2 to 4 inch slump. Distribute concrete evenly to the approximate final floor level. Compact and screed, filling in low spots until it becomes a level mass. Use only a wood bull float or wood darby. Do not overwork the surface.

Correcting For Excessive Bleeding: Do not use cement or a cement-sand mixture to absorb bleeding water. Should concrete bleed excessively, removal of water by dragging surface with rubber hose, burlap, or similar method is suggested.

**Registered trademark.*

2. FLOAT—Fill all voids and hollows in floor, using wood darby,

wood bull float, or mechanical float with a disc or blades.

3. APPLY FIRST SHAKE—Apply Ready-4-Use *Masterplate* as it comes from the bag. *Do not add cement.* For heavy-duty floors apply

at a rate of one bag of Ready-4-Use *Masterplate* (90 lbs.) per 100 sq. ft. for the first shake. For moderate to heavy-duty floors proportion accordingly.

As soon as there is no free water on the surface, distribute the first shake evenly, in a uniform pattern, working small areas at a time. Bend low and let the material sift through the fingers. Do not throw it, as throwing causes the material to segregate. Throwing can be avoided by bridging the slab.

4. FLOAT FIRST SHAKE — Allow the shake to wet thoroughly and float with a mechanical disc or bladed float. If the surface will not support a heavy disc float, float the shake by hand or by use of a trowelling machine equipped

with float blades in flat position. *Never* add water to the surface to assist in floating. The moisture must come to the surface through the shake to assure bond. Do not overwork.

5. APPLY SECOND SHAKE — Immediately after floating the first

shake, apply the second shake as in Operation 3.

6. FLOAT SECOND SHAKE—As soon as moisture begins to come

through, float the second shake as in Operation 4.

7. FIRST STEEL TROWELLING — When sheen has disappeared, follow with a flat steel trowelling,

either by hand or with a mechanical trowel. Trowel must be kept flat. Do not over-trowel nor burnish trowel.

8. SECOND STEEL TROWELLING— When the surface has stiffened to a point where no additional

water or fines will be brought to the surface, follow with a second steel trowelling, raising the trowel to produce a smooth finish. Do not burnish.

Slip-Resistant Finish:

Where a slip-resistant finish is desired, after the first steel trowelling (Operation 7), go over the area with mechanical disc float with hammers, or give the surface a swirled finish by flat trowelling, using a circular motion, bringing the iron up in fine ridges. Only slight ridges are desirable and necessary. Do not raise deep ridges.

9. CURE—Non-Colored Floor: As soon as the surface is hard enough

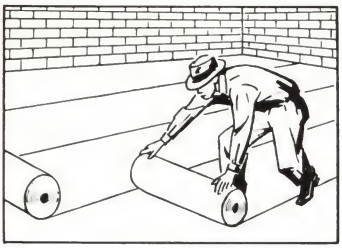
not to be marred by the application, and before the surface has dried out, apply one coat of Master Builders *MasterKure* membrane curing compound. Apply with a soft bristle brush or by spray, as uniformly as possible.

Colored Floor: As soon as the surface is hard enough not to be marred by the application, and before the surface has dried out,

apply a coat of Master Builders *Kurowax,* the same color as the floor. *(Kurowax* cures and waxes in the same operation.) Use a *mohair* roller coater to apply the *Kurowax* thinly and uniformly.

10. PROTECT — Cover the dried *Kurowax* surface with scuff-proof building paper, overlapped two or three inches to protect the surface from plaster and paint droppings and marring by other trades,

until floor is to be put into service.



11. CLEAN AND POLISH—When floor is to be put into service, re-

move paper and wash the floor. Let dry. Polish with electric polisher with soft bristles, or with weighted polishing brush.

Topping Method: (Two Course)

1. Apply a topping of 1″ minimum thickness to a new or "green" base slab. Prepare a mix using (by weight):

1 part standard portland cement;
1½ parts clean concrete sand;
1½ parts hard pea gravel or stone, graded from ⅛″ to ⅜″;
with approximately 4½ gallons of water per bag of cement.

Note: If local aggregates produce a harsh mix, the above proportions should be varied to secure a workable mix. Maintain a 1 to 3 ratio of cement to aggregate.

2. If the concrete in the base slab has not taken its initial set, a bond coat is not required. If it has taken initial set, scrub into the surface a slush bond coat of standard portland cement with a stiff bristled broom. Time this operation so that the bond coat will not set or dry out before the topping mortar is placed.

3. Place, rake, level, compact and screed the topping.

4. Float the surface to compact the topping mortar and to bring moisture to the surface. Use only a wood float or wood darby.

5. Continue with Operations 3 to 11 as outlined in the Monolithic (One-Course) Method.

Resurfacing Old Floors or Topping Set Slabs:

(*Caution:* Do not attempt to resurface slabs that are not structurally sound.)

1. The entire surface of old or set slab should be roughened with a bush hammer, jack hammer or mechanical scarifying equipment. Thoroughly clean and flush the surface. Saturate with clean water continuously for 24 hours prior to application of topping.

2. Scrub a slush bond coat of standard portland cement into the roughened surface with a stiff bristle broom. Time this operation so that the bond coat will not dry out or set before the topping mortar is placed.

3. Design and place the topping mortar with a minimum of 1″ thickness, as outlined in the Topping (Two-Course) Method.

READY-4-USE *MASTERPLATE*

PRECAUTIONS:

1. The directions given above are based on job and material temperatures of 60° F to 90° F. For abnormal conditions, such as high or low temperatures, high winds, hot sun, low humidity, poorly graded aggregates, or where the use of air-entrained concrete cannot be avoided, consult your nearest Master Builders man for detailed directions or using the product under these conditions. Master Builders branch offices are located in all principal cities.

2. Avoid the use of chlorides in concrete over which Ready-4-Use *Masterplate* is applied. During cold weather, heating the mix or working in a heated area is recommended in order to avoid retarded hardening and retarded strength gains.

3. The concrete over which Ready-4-Use *Masterplate* is distributed should be made with standard portland cement (ASTM Specification C-150) in preference to air-entraining portland cement. If air-entraining cement is used in the concrete, the entrained air content should be less than 3%. The shake should not be floated into the surface until the concrete has stiffened somewhat, and the surface should not be overworked through excessive floating and trowelling. (See Master Builders Technical Bulletin No 16.)

4. A membrane curing compound *(MasterKure* for non-colored floors; *Kurowax* for colored floors) must be applied as soon as the surface has hardened sufficiently so as not to be marred by the application. Early curing is of the utmost importance, especially during high temperatures or where areas are exposed to the sun.

Non-Slip MASTERPLATE

Concrete Floor Hardener with Abrasive Aggregate for Producing Slip-Resistant Surfaces

DESCRIPTION:

Non-Slip *Masterplate** is a combination of standard *Masterplate,* colored or non-colored, with an alundum-type abrasive aggregate replacing 25% by weight of the *Masterplate* aggregate. It combines the slip-resistant qualities of abrasive aggregate with the wear-resistance, low absorption, corrosion-resistance and built-in color of *Masterplate.* Pre-mixing of slip-resistant aggregate with metallic aggregate provides uniform distribution of the slip-resistant aggregate.

NOTE: Only those alundum particles which remain at the surface afford protection from slipping; those which are buried below the surface are of little value and, since they are expensive, they increase the cost of the floor without contributing to its slip-resistance. In a shake of 30 to 40 lbs. of Non-Slip *Masterplate* per 100 square feet, the majority of alundum particles remain at the surface, and the small proportion that is buried can be disregarded. However, when a heavy-duty shake of 60 to 80 or more pounds per 100 square feet is used, the percentage of grits below the surface is high and the waste is considerable. This should be avoided.

Under such conditions, when a heavy-duty *Masterplate* floor is required to have a non-slip surface it is recommended that the contractor purchase regular *Masterplate* and Non-Slip *Masterplate.* Apply the regular *Masterplate* in two shakes, floating in each shake, and apply the Non-Slip *Masterplate* as a final shake to assure keeping the abrasive aggregate at the surface. This shake is floated and given a final trowelling.

Another alternative, particularly for large areas, is to purchase separately the regular *Masterplate* and the slip-resistant grits and apply the grits as a final shake followed by floating and final trowelling. From 7½ to 15 lbs. of slip-resistant grits (No. 00) per 100 square feet, applied as above, is the general practice.

WHERE USED:

In constructing ramps, stairs, treads, landings, etc., where a slip-resistant aggregate at the surface is required for maximum safety.

ADVANTAGES OF NON-SLIP *MASTERPLATE:*

1. Combines slip-resistant qualities of abrasive aggregate with the wear-resistance, low absorption, corrosive-resistance and built-in color of *Masterplate.* Use of abrasive aggregate alone does not provide sufficient wear resistance.

2. Pre-mixing of slip-resistant aggregate with metallic aggregate provides uniform distribution of non-slip aggregate.

**Registered trademark.*

NON-SLIP MASTERPLATE

COLORS:

Tile Red	Seal Brown	Battleship Gray
Persian Red	Terra Cotta	Non-Colored
Black	Maroon	

(See Color Chart, Page 2)

(Nile Green, Tan and French Gray are made with non-metallic aggregate.)

ESTIMATING DATA:

Use 0.3 to 0.6 lb. Non-Slip *Masterplate* per square foot.

Where thicker *Masterplate* armouring is required to meet heavier traffic conditions, procure both regular *Masterplate* and Non-Slip *Masterplate,* both of the same color, if color is used. Apply two shakes of the regular *Masterplate* with a third shake of Non-Slip *Masterplate.*

PACKAGING:

100 lb. moisture resistant cloth bags.

FREIGHT CLASSIFICATION:

Iron Borings, Ground, Not Powdered.

DIRECTIONS:

See your Master Builders man for complete instructions.

D P S MASTERPLATE

For Producing Industrial Spark-Resistant Floors of Great Wear-Resistance

DESCRIPTION:

D P S *Masterplate* is a complete, ready-to-use product applied as a dust-coat or shake to freshly floated concrete. For producing iron-armoured concrete floors that are static-disseminating, spark-resistant, non-combustible and wear-resistant. D P S *Masterplate* is properly graded metallic aggregate — free from rust, non-ferrous metal particles, oil, grease and soluble alkaline compounds — combined with Master Builders' exclusive water-reducing agent and a specially designed conductive binder.

WHERE USED:

In hazardous areas, such as:

1. In areas where red label products are manufactured, handled, stored and used.

2. In areas where there are explosives or explosive dusts.

3. Where static charges are continually being generated by continuous processes such as in paper and textile operations.

ADVANTAGES OF D P S *MASTERPLATE*:

1. D P S *Masterplate* meets all the requirements of the NAVDOCK Specification 48 Y (September 1959), "Static Dissemination and Spark-Resistant Floor Finishes for Ordnance and Other Structures". (See Ad. No. P-1041)

2. Because of the efficient water-reducing agent, 1.8 pounds of D P S *Masterplate* can be floated on the surface of the slab, producing an armoured surface approximately ⅛" thick. This thick bonded surface, free from contamination by aggregates from the slab below, is needed to provide a spark-resistant armour.

3. The specially treated conductive binder provides conductivity within a wide range of temperatures. A plain cement binder tends to rise in electrical resistance below freezing, or drying-out from high temperatures. The binder used in D P S *Masterplate* remains conductive at temperautres from 20° to 150°F. (See Technical Bulletin No. 38).

4. Ready-To-Use — it is ready to apply as it comes from the package. D P S *Masterplate* is produced and packaged under rigid laboratory control in Master Builders' new modern plant.

ADVANTAGES OF DPS *MASTERPLATE* FLOORS:

1. WEAR-RESISTANCE AND DURABILITY: D P S *Masterplate* floors have the high resistance to wear of Ready-4-Use *Masterplate.* Also the other important features of easy-to-clean; resistance to the effects of moisture and steam; non-dusting and corrosion resistance. Many types of safety flooring are lacking in one or more of these qualities because of the nature of the materials from which they are produced.

2. ELECTRICAL CONDUCTIVITY: D P S *Masterplate* floors have optimum electrical conductivity under the wide ranges of temperatures found in industry. This is not true of many types of safety flooring which lose much of their conductivity at high or low temperatures. D P S *Masterplate* floors meet the NAVDOCK Specification 48Y which requires the flooring remain static disseminating even when it becomes "oven-dry".

3. SPARK-RESISTANCE: With D P S *Masterplate* a ductile, smooth finished floor can be produced that has a high degree of spark-resistance to dropped tools and other metal objects that cause sparks when struck against a plain concrete floor. (Note: Materials such as emery, silica, flint and other natural aggregates, produce sparks when struck against iron and steel; similarly, the iron-armoured D P S *Masterplate* floor would not be spark-resistant to emery, flint, etc. Carborundum and alundum grits commonly used for producing a "non-slip" surface should not be used when a spark-resistant floor is required. Non-slip trowelling should not be used.)

4. HIGH DENSITY SURFACE: The low water-cement ratio secured by water reducing agent assures a low porosity surface with 50% less absorption, free from cracks, pits and ruts — very important in areas where explosive and inflammable powders and liquids are handled. Low porosity also assures ease of cleaning and high resistance to corrosion.

5. NON-DUSTING: A D P S *Masterplate* floor when properly cured will not dust — an important consideration when explosive powders are present.

6. EASY TO REPAIR: A D P S *Masterplate* floor can be easily repaired if for any reasons a portion requires patching.

DIRECTIONS:

READ THIS FIRST—D P S *Masterplate* is used for producing a static-disseminating, spark-resistant, heavy-duty floor by incorporating a thick layer of the specially prepared dust-coat material on the surface of the freshly floated concrete. Unless the directions are followed, the purpose of using D P S *Masterplate* may be defeated.

These directions are based on the use of well designed, non-air-entrained concrete mix of plastic consistency, where job and material temperatures of 60°F to 80°F prevail. For abnormal conditions such as high winds, hot sun, low humidity, poorly graded aggregates or where the use of air-entrained concrete can not be avoided, consult your nearest Master Builders' field engineer for detailed directions on using the product under these conditions. Master Builders Branch offices are located in all principal cities.

IMPORTANT: Do not contaminate the D P S *Masterplate* surface with sand, loose mortar, concrete or other spark producing material during the floating, troweling and curing operations. Clean loose concrete and other material from shoes, trouser cuffs, knee boards, planks, floats and trowels before working on the D P S *Masterplate* surface.

MONOLITHIC (One-Course) METHOD

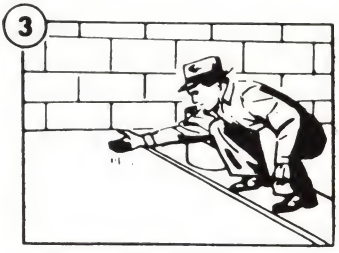
1. PLACE, COMPACT AND SCREED—In mixing the concrete for the slab use as little water as possible to produce a plastic consistency of approximately 4" slump. Distribute concrete evenly to the approximately final floor level. Compact and screed, filling in low spots, until it becomes a level mass.

Important—Experience has shown that one finisher is required for each 300 sq. ft. of D P S *Masterplate* floor.

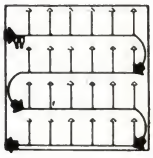
Correcting For Excessive Bleeding: The use of concrete which bleeds excessively should be avoided. Do not use cement or a cement-sand mixture to absorb bleeding water. Should concrete bleed excessively, a high quality floor can be obtained only by removal of water by dragging surface with rubber hose, burlap or similar method, immediately prior to floating and application of the first shake.

2. FLOAT—Close all voids and hollows in the floor using a wood bull float. Do not wait for the concrete to stiffen sufficiently to bear the weight of the mechanical floating equipment.

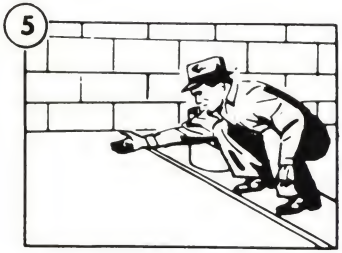
Dust Coat Requirements: To produce a static-disseminating and spark-resistant floor, it is imperative two 90 lb. bags of D P S *Masterplate* be used per 100 sq. ft. of floor. Applied as a dust-coat in two shakes—½ of the total amount of D P S *Masterplate* is used for each shake.



3. APPLY FIRST SHAKE—Apply D P S *Masterplate* shake as it comes from the bag. DO NOT ADD CEMENT. Immediately after floating distribute 1 bag of D P S *Masterplate* uniformly over 100 sq. ft. of surface—this is the first shake. Distribute the shake over a small area, moving back and forth across the floor in a uniform pattern as shown in sketch. Avoid segregation. Do not throw shake too far. **Do Not Contaminate Surface.**



4. FLOAT FIRST SHAKE—Allow D P S *Masterplate* to wet thoroughly. The first shake should be worked with a wood hand float or wood bull float. Never add water to the surface to assist in floating. The moisture must come to the surface through the shake to assure bond. **Do Not Contaminate Surface.**



5. APPLY SECOND SHAKE—Use D P S *Masterplate* as it comes from the bag. DO NOT ADD CEMENT. Apply the second shake immediately, distributing 1 bag of D P S *Masterplate* uniformly over 100 sq. ft. of surface* moving across the floor at right angles to the direction used in applying the first shake — see sketch page 29. Walk on clean board to prevent contaminating surface of first D P S *Masterplate* shake. **Do Not Contaminate Surface.**

**Note—the first and second shakes add up to 2 bags (180 lbs.) of D P S Masterplate per 100 sq. ft. of surface.*

6. FLOAT SECOND SHAKE—After the D P S *Masterplate* shake has absorbed surface moisture, float with a wood hand float, mechanical trowel with float blades or heavy mechanical disc float. Use a wood float wherever possible. Do not wait between operations and do not allow D P S shake to lay unfloated on surface any longer than necessary. Never add water to the surface to assist floating—the water must come up from the base through the shake during floating to assure bond. **Do Not Contaminate Surface.**

7. STEEL TROWELING—Flat steel trowel the surface immediately, either by hand or with a mechanical trowel. Temperatures, drying conditions and setting properties of the cement govern the timing of the first steel troweling. Do

not over-trowel or work the surface excessively. Heel marks are difficult to remove at this point; finishers should wear smooth soled boots or work from kneeboards. **Do Not Contaminate Surface.**

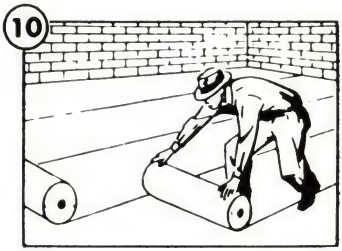
8. FINAL TROWELING—When trowel can be raised without causing excessive marks or blisters, it is ready for final trowelling. Do not attempt a burnish or extremely hard finish.

(Caution: Non-slip trowelling or swirl trowelling reduces the spark-resistance and should not be employed.) **Do Not Contaminate Surface.**

9. CURING FINISHED FLOOR—As soon as the floor finish has hardened so that it will not be damaged by application, spray or brush one coat of Master Builders *Konductokure,* the conductive membrane curing compound, as thinly and uniformly as possible. Spraying *Konductokure* is preferable since it permits earliest application. Do not wait till the following day to apply *Konductokure* — early application is important.

Follow directions on *Konductokure* pail.

(Caution: Do not cure D P S Masterplate with anything other than Konductokure.) Ordinary membrane curing compounds insulate the surface and prevent static charges from being disseminated—they must never be used for curing D P S *Masterplate* floors.



10. PROTECT SURFACE—Protect the surface from dropping of plaster, dirt and other marring by covering the dried *Konductokure* surface with building paper. Do not use sand for protection—not even over the building paper.

11. CLEANING—After the structure is otherwise complete and when other trades have left, remove the paper from the floor and thoroughly clean the surface.

12. POLISHING — OPTIONAL — Where polished floors are desired, apply a conductive wax such as Master Builders *Konductowax.* Follow directions on *Konductowax* container.

Topping Method: (Two-Course)

1. The base slab should be left

with a level, rough surface (wire broom finish) suitable for bonding a topping of minimum 1″ thickness.

2. Thoroughly clean and flush the surface of all dirt, oil and paint. Saturate with clean water continuously for 24 hours prior to the application of the topping.

3. Scrub a slush bond coat of standard portland cement into the roughened surface with a stiff bristle broom. Time this operation so that the bond coat will not dry out or set before the topping mortar is placed.

4. Use a topping mix with clean well-graded concrete sand and ⅜″ pea gravel and a water-cement ratio of 4½ gallons of water (or less) per sack of cement.

5. Apply the topping to a minimum 1″ thickness, rake, level, compact and screed the topping.

6. Float the surface to compact the topping mortar, to fill voids and to bring mortar to the surface. Use a wood float, wood bull float or floating machine.

7. Continue with Operation 3 to 12 as outlined in the Monolithic (One-Course) Method.

RESURFACING OLD FLOORS:

(Caution: Do not attempt to resurface slabs that are not structurally sound, or which, after scarifying, still contain oil or corrosive materials.)

1. The entire surface of the existing slab to be resurfaced should be roughened with a jack hammer, rock drill or mechanical scarifying equipment, to provide a sound, clean surface. The topping must be of minimum 1″ thickness.

2. Continue with Operations 2 to 7 as outlined in the Topping Method.

PRECAUTIONS:

1. Do not contaminate surface.

2. Avoid the use of chlorides in concrete over which DPS *Masterplate* is applied. During cold weather, heating the mix or working in a heated area is recommended in order to avoid retarded hardening and retarded strength gains.

3. The concrete over which D P S *Masterplate* is distributed should be made with standard portland cement (ASTM Specification C-150) in preference to air-entraining portland cement. If air-entraining cement is used, the entrained air content should be less than 3%. The shake should not be floated into the surface until the concrete has stiffened somewhat, and the surface should not be overworked through excessive floating and trowelling. (See Master Builders Technical Bulletin No. 16.)

4. D P S *Masterplate* floors must be cured with Master Builders *Konductokure* applied by brush or spray as soon as the surface has hardened sufficiently so as not to be marred by the application. Early curing is of utmost importance.

ESTIMATING DATA:

1.8 pounds of *D P S Masterplate* per square foot produces a static-disseminating, spark-resistant, heavy duty floor. This will employ one bag of *D P S Masterplate* (90 lbs. per bag) per fifty square feet or two bags (180 lbs.) per one hundred square feet. This complies with the requirements of NAVDECK Specification 484.

PACKAGING:

90 lb. polyethylene line burlap bags.

FREIGHT CLASSIFICATION:

Iron Borings, Ground, Not Powdered.

RELATED PRODUCTS:

KONDUCTOKURE*— A conductive membrane curing compound for curing D P S *Masterplate* floors.

KONDUCTOWAX*— A conductive wax for waxing D P S *Masterplate* floors.

STANDARD SPECIFICATION:

The static-disseminating and spark-resistant floors . . . (as indicated) shall be constructed with D P S *Masterplate* using 1.8 pounds per square foot in strict accordance with directions furnished by the manufacturer, The Master Builders Company.

Note: Before preparing the specifications. A static-disseminating, spark-resistant concrete floor is the most specialized type of floor known to the industry. For this reason it is desirable that the architect or the engineer discuss the specific problem with the Master Builders field man prior to writing specifications for a particular job. He can supply a copy of our detailed specifications for Spark-Safe Floors (June 1, 1958).

**Registered trademark.*

COLORCRON

Colored, Ready-to-Use Concrete Floor Hardener

DESCRIPTION:

*Colorcron** is a ready-to-use dust-coat or shake for coloring and hardening concrete floors. It is a dry mixture of portland cement, tough, wear-resistant, properly graded silica aggregates combined with finely ground coloring pigments, Master Builders' water-reducing agent and other exclusive technical components which improve the properties of the finished floor.

COLORCRON gives concrete floors warmth and beauty at low cost.

WHERE USED:

As a dust-coat for coloring and hardening concrete floors subjected to traffic such as in churches, residences, apartment houses, showrooms, offices and other areas where attractive uniform color enhances the appearance of the floor. (Where greater wear-resistance is required, Colored *Masterplate** or Colored Ready-4-Use *Masterplate* is recommended.)

ADVANTAGES OF COLORCRON:

1. PROPER GRADATION: The hard silica aggregates are separated into proper size gradations, then recombined in definite proportions to assure maximum density of the surface.

2. EXCLUSIVE TECHNICAL COMPONENTS IN COLORCRON: These exclusive technical components, which include Master Builders' time tested water reducing agent, extend the available moisture at the surface of the slab, making it possible to incorporate 0.5 lb. or more of aggregate per square foot. These technical components assure high

**Registered trademark.*

compressive strength and permit applying a heavy shake — the two basic qualities for long floor life.

3. LIGHT-FAST AND ALKALI-FAST PIGMENTS: Only the best finely ground, light-fast and alkali-fast inorganic oxides are used in manufacturing *Colorcron.* Master Builders' exclusive technical components increase the intensity of the color.

ADVANTAGES OF COLORCRON FLOORS:

1. LESS COST: Costs less than painting. Annual painting is eliminated.

2. WEAR-RESISTANT: Outwears the best plain concrete floor. Ordinary mortar colors in the mix lower strength; *Colorcron* increases strength.

3. UNIFORM COLOR: More uniform and more intense color than is obtained from the use of pigments put into the entire topping mix.

4. READY-TO-USE: Eliminates mixing dust-coat on the job site.

Factory tested and selected cement of the proper type is used, eliminating this as a variable.

Factory preparation assures accurate proportioning of cement and aggregate. Careless proportioning or variable materials on the job affects uniformity of color and wearing quality of the floor.

Factory mixing of all materials assures proper and uniform distribution of cement and also prevents contamination of the materials in the job mixing process.

COLORS:

Tile Red	Seal Brown	Battleship Gray
Persian Red	Tan	French Gray
Terra Cotta	Black	Nile Green
Maroon		Coral Gables Beige

(See Color Chart, Page 2)

ESTIMATING DATA:

Use 35 to 65 lbs. of *Colorcron* per 100 sq. ft. depending on the thickness of colored high strength mortar needed for the particular exposure to traffic and wear. For heavily used areas it is possible to properly incorporate 100 lbs. per 100 sq. ft.

PACKAGING:

35 lb. pails and 50 lb. and 100 lb. moisture-resistant bags.

FREIGHT CLASSIFICATION:

Cement Compound, Building or Floor, Dry.

STANDARD SPECIFICATION:

Into the surface of all concrete floors (as indicated) shall be incorporated (insert color) *Colorcron* using (insert quantity) of *Colorcron* per 100 sq. ft., in strict accordance with the directions of the manufacturer, The Master Builders Company.

COLORCRON

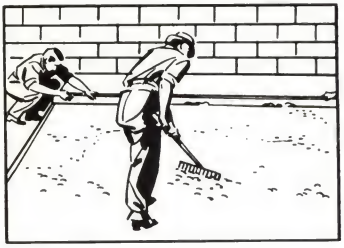
RELATED PRODUCTS:

KUROWAX*—Curing and maintenance wax, in colors to match those of *Colorcron.*

COLORED *MASTERPLATE**—** Metallic and non-metallic aggregate for producing heavy-duty floors.

DIRECTIONS:

1. PLACE, SCREED TO LEVEL— Place fairly stiff and screed to level. (When the dust-coat is applied in Operations 3 and 5, the exclusive



technical components in *Colorcron* will provide plasticity and will make it possible to float the dust-coat into concrete that has been placed fairly dry.)

2. FLOAT—When the concrete can support a finisher (or mechanical float), float and work in the coarse aggregate, filling voids and hol-

lows to get level surface. Secure final level with this floating, to avoid overworking after applying color. Use wood float or wood darby only.

Wait until all free water has disappeared or has been removed from surface before proceeding with next operation. If some sections appear too dry, float them again to bring up moisture.

Colorcron should be applied at the rate of 35 to 65 lbs. per 100 sq. ft. Distribute the *Colorcron* in two separate shakes, using one-half the amount for each shake.

3. APPLY FIRST SHAKE—Distribute the first shake evenly, in a uniform pattern, working small areas at a time. (Generally, the edges will be ready for the shake sooner than the remainder of the

slab.) Bend low and let the material sift through the fingers. Do not throw it, as throwing causes the material to segregate. Throwing can be avoided by bridging the slab.

4. FLOAT FIRST SHAKE—Wait until *Colorcron* is completely damp from the moisture it has drawn up from the slab; then float the *Colorcron* into the concrete, using a wood float. *Never* add water to the surface to assist in floating. The moisture must come

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to the surface through the shake to assure bond. Do not overwork. Pay particular attention to the edges, as wood forms have a tendency to dry the edges of the slab.

5. APPLY SECOND SHAKE — Immediately after floating the first

shake, apply the second shake, as in Operation 3.

6. FLOAT SECOND SHAKE—As soon as moisture begins to come

through, float the second shake, as in Operation 4.

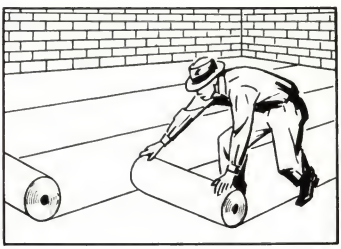
7. TROWEL—When surface begins to stiffen, steel trowel to desired

finish. Avoid over-trowelling. *Do not burnish.*

8. CURE AND WAX—As soon as the surface is hard enough not to be marred by the application, and before the surface has dried out,

apply a coat of Master Builders *Kurowax,* the same color as the floor. *(Kurowax* cures and waxes in the same operation.) Use a *mohair* roller coater to apply the *Kurowax* thinly and uniformly.

9. PROTECT — Cover the dried *Kurowax* surface with scuff-proof



building paper, overlapped two or three inches, to protect the surface from plaster and paint droppings

and marring by other trades. Do not put curing paper,polyethylene sheeting or damp sand over *Colorcron* — efflorescence stains or variations in color may result.

10. CLEAN AND POLISH—When

floor is to be put into service, remove paper and wash the floor. Let dry. Polish with electric polisher with soft bristles, or with weighted polishing brush.

Note: A pleasing tile-like effect may be obtained by scoring the *Colorcron* surface two or three days after it has hardened. This is done with a power saw fitted with a carborundum blade. Scoring to a depth of 1/16″ is sufficient.

METALICRON

Specially Processed Metallic Hardener
For Increasing the Wear Resistance of Concrete Floors

DESCRIPTION:

*Metalicron** is a specially processed, graded and prepared metallic aggregate combined with Master Builders efficient plasticizing agents. Dry-mixed with portland cement on the job, it is applied uniformly as a dry shake over freshly floated concrete or concrete topping, then finished in the normal manner. *Metalicron* covers and armours the hard, but brittle surface of the mortar and natural aggregate beneath it. Because it is tougher than the hardest natural aggregate, *Metalicron* resists abrasion . . . and because it is malleable rather than brittle, it also increases the impact resistance of the concrete or concrete topping to which it is applied.

WHERE USED:

To increase the wear resistance of concrete floors and concrete toppings in warehouses, loading docks, machine shops, ramps, manufacturing and assembly areas.

As an economical improvement for all other concrete floors . . .a light or moderately heavy shake of *Metalicron* has considerably greater wear resistance—yet costs only pennies more than plain concrete or liquid surface treatments. It eliminates the need for periodic costly after-treatments.

In areas that must have a long lasting non-slip finish, yet provide a durable wear resistant surface under foot and wheel traffic.

For floor areas subjected to oil, grease, strong cleaning compounds and mechanical sweepers.

In precision manufacturing areas where equipment and products must not be contaminated from the dust and grit commonly found on the surface of plain concrete and high strength concrete toppings.

To armour concrete topping and concretes used for resurfacing or replacing floors which have failed to withstand traffic or production operations.

ECONOMY OF *METALICRON*:

Metalicron is designed for economical applications of light and moderately heavy shakes. It is often applied in heavier shakes by experienced floor contractors. The iron aggregate in *Metalicron* is free of rust, oil (both petroleum and cutting oils), dirt, non-ferrous metals and corrosive materials. *Metalicron* is manufactured in Master Builders own iron plants.

**Registered trademark.*

METALICRON

OTHER ADVANTAGES OF THE *METALICRON* FLOOR:

1. Non-Dusting: *Metalicron* floors are non-dusting because the brittle aggregates and fines of the concrete or topping surface which commonly disintegrate under traffic abrasion and impact are now iron armoured and protected by the malleable *Metalicron* surface.

2. Easy to Clean: *Metalicron* floors are less absorbent than concrete or concrete topping and are easy to clean. Materials spilled on *Metalicron* floors, including oil and grease, remain on the surface where they can be readily removed.

3. Durable Non-Slip Finish: The *Metalicron* surface can be given a non-slip finish during the floating or trowelling operations. The iron particles turned up in ridges are tougher than the natural aggregate-cement mortar of concrete . . . thus the non-slip *Metalicron* finish is more durable and longer lasting.

ESTIMATING DATA:

Apply 0.3 to 1.0 pounds of *Metalicron* per square foot, depending on severity of traffic or thickness of armouring desired.

PACKAGING:

Metalicron is packaged in 100 pound moisture resistant bags.

FREIGHT CLASSIFICATION:

Iron Borings, Ground, Not Powdered.

STANDARD SPECIFICATION:

Into the surface of all concrete floors (as indicated) shall be incorporated a mixture consisting of 2 parts of *Metalicron* and 1 part portland cement by weight, using (insert quantity) pounds of *Metalicron* per square foot, in strict accordance with the directions of the manufacturer, The Master Builders Company.

RELATED PRODUCTS:

MASTERKURE*—Membrane curing compound for curing floors surfaced with *Metalicron.*

MASTERPLATE*—Metallic aggregate for producing heavy-duty floors.

ANVIL-TOP*—All-iron aggregate floor topping for extra heavy-duty protection for key areas.

**Registered trademark.*

DIRECTIONS:

HOW METALICRON IS APPLIED

1. PLACE, SCREED TO LEVEL

2. FLOAT

Thoroughly mix (dry) 2 bags of Metalicron with 1 bag standard portland cement

3. PREPARE SHAKE

4. APPLY FIRST SHAKE (½ of Total Shake)

5. FLOAT SHAKE

6. SECOND SHAKE (Repeat Operation 4)

7. SECOND FLOATING (Repeat Operation 5)

6. and 7.

8. TROWEL

9. FINAL TROWELING

10. CURE & PROTECT

PRECAUTIONS:

Avoid the use of chlorides in the concrete over which *Metalicron* is applied. During cold weather, exercise precautions to eliminate the need for an accelerator in the concrete over which *Metalicron* is to be applied.

Metalicron should be used with standard portland cement, Type I, in preference to air-entraining portland cement—both in preparing the shake and in the fresh concrete over which *Metalicron* is applied. If air-entrained concrete is used, the entrained air content should be less than 3%.

Store *Metalicron* as you would portland cement.

COLORMIX

For Integrally Coloring Mortar Used for Bases, Coves, Risers and Other Vertical Surfaces

DESCRIPTION:

*Colormix** is a dry powder containing Master Builders' water-reducing agent and other exclusive technical components, which improve the properties of the finished concrete, combined with stable superfine coloring pigments. On the job site, *Colormix* is mixed with portland cement, aggregate and water to form a colored mortar. The quantity of *Colormix* used per bag of portland cement varies with the color used (see Estimating Data, below).

COLORMIX in adjoining vertical surfaces enhances colored floors.

WHERE USED:

For coloring the mortar adjacent to Colored *Masterplate** and *Colorcron** floors, such as coves, and risers of stairs, or for plaster coating the sides of equipment bases, and other vertical surfaces where an integrally colored mortar is easier to apply than would be a colored dust-coat.

For coloring concrete used to protect electric conduits and pipes beneath the floor . . . a safeguard for positive identification.

Colormix may also be used for coloring the topping of concrete floors. However, the economy and results obtained with Colored *Masterplate* and *Colorcron* are more satisfactory.

ADVANTAGES OF COLORMIX:

1. Mortars colored with *Colormix* complement floors surfaced with Colored *Masterplate* and *Colorcron.*

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2. *Colormix* increases the strength and decreases the permeability and absorbtion of mortar because of the reduction in water-cement ratio provided by Master Builders' exclusive technical components. Ordinary mortar colors decrease strength and increase permeability and absorption.

3. *Colormix* mortars are light-fast and alkali-fast.

COLORS:

Tile Red	Seal Brown	Battleship Gray
Persian Red	Tan	French Gray
Terra Cotta	Black	Nile Green
Maroon		

(See Color Chart, Page 2)

ESTIMATING DATA:

For Tile Red, Persian Red, Terra Cotta, Maroon, Seal Brown, Tan, Black and Battleship Gray, use 5 pounds of *Colormix* per bag of portland cement.

For French Gray, and Nile Green, use 10 pounds of *Colormix* per bag of portland cement.

PACKAGING:

50 pound bags.

FREIGHT CLASSIFICATION:

Cement Compound, Building or Floor, Dry.

STANDARD SPECIFICATION:

The mortar used in bases, coves, risers, etc. (indicate sections) shall be colored with (indicate color) *Colormix,* used in strict accordance with the directions of the manufacturer, The Master Builders Company.

DIRECTIONS:

See your Master Builders man for complete instructions.

SANISEAL

Chemical Hardener for Non-Colored Concrete and Terrazzo Floors

DESCRIPTION:

*Saniseal** is a fluosilicate-type compound which hardens, densifies and checks the dusting of concrete and terrazzo floors already installed. *Saniseal,* when converted to liquid, penetrates into the concrete and reacts chemically with the free lime of the cement binder, resulting in the deposit of hard, wear-resistant compounds in the pores of the wearing surface.

Three formulations are available:

***Saniseal* No. 50**—Blend of magnesium fluosilicate and zinc fluosilicate which meets government specifications.

***Saniseal* No. 100**—Magnesium fluosilicate for general usage.

***Saniseal* No. 200**—Special blend of magnesium fluosilicate and zinc sulfate (not recommended for floors subjected to excessive moisture or frequent washing).

Saniseal is supplied as a dry powder, easily converted to a liquid at the job site by dissolving in water — this saves shipping and handling cost.

Saniseal does not affect the final color of a non-colored floor.

WHERE USED:

Dusty floors are costly.

On newly constructed floors, where a surface treatment is specified. On new or old concrete floors that are soft and starting to dust and on floors that were not cured when installed. To densify concrete surfaces subjected to moisture and mild corrosive solutions.

Not recommended for livestock feed troughs and feeding floors.

Not recommended for colored floors, as it may leave a white deposit which is difficult to remove.

ADVANTAGES OF *SANISEAL:*

1. Arrests dusting of concrete and terrazzo floors.
2. Makes porous and dusting floors more wear-resistant.
3. Densifies surface and reduces absorption.
4. Reduces shipping and handling expense—similar liquid chemical hardeners weigh 10 pounds per gallon. Equivalent *Saniseal* crystals weigh 2 pounds—saving freight on 8 pounds.

ESTIMATING DATA:

2 pounds of *Saniseal* dissolved in warm water cover approximately 100

*Registered trademark.

square feet. See Directions, below, for preparing solution for 1, 2 or 3 coat treatments.

PACKAGING:

400 lb. barrels, 50, 15 and 10 lb. cartons.

FREIGHT CLASSIFICATION:

Cement Compound, Building or Floor, Dry.

STANDARD SPECIFICATION:

All concrete (or terrazzo) floors shall be hardened with *Saniseal* (insert type number), used in strict accordance with the directions of the manufacturer, The Master Builders Company.

DIRECTIONS:

PREPARING FLOOR FOR HARDENING WITH *SANISEAL*:

The floor should be broom-clean and dry. Paint, oil, grease and curing compounds inhibit the penetration of *Saniseal* solution and should be removed by the following methods:

To Remove Paint: Dissolve one pound of lye in a gallon of water. (Handle with caution, as lye will burn the skin.) Flush the solution on the floor and let stand for one hour. Then wire-brush the floor thoroughly and sweep the residue off the floor with water and brooms. All trace of the lye solution must be washed from the floor, as lye, if left on concrete, has a harmful effect.

To Remove Oil and Grease: Spread a thick mixture of lime and water over the grease or oil-soaked area and let stand for several hours. Then scrape the residue off and wash thoroughly with clear water, or scrub thoroughly with tri-sodium phosphate.

To Remove Curing Compounds: Spread a high solvency naphtha or aromatic petroleum solvent evenly over surface. Make sure to keep surface wet with solvent for 3 to 5 minutes. Wipe up the excess solvent and softened coating with rags. Be sure to start the wiping operation before the solvent has evaporated. (*Caution:* These solvents are flammable and proper precautions should be exercised. Also, adequate ventilation should be provided.)

How To Apply *Saniseal:*

Type of Containers for Mixing and Applying *Saniseal*:

Dissolve *Saniseal* in warm water, in a plastic pail in proportions indicated for one, two or three coat treatments. Galvanized steel pails or sprinkling cans should be used only when the solution is used promptly. Do not let it stand in metal pail and do not cover the pail.

Average Floors—One Coat Treatment:

1. Dissolve *Saniseal* in warm water, using 2 pounds of *Saniseal* to 1 gallon of warm water. (Note Precaution on avoiding contact with eyes, skin and clothing.)

2. Apply *Saniseal* solution, using galvanized sprinkling can. Apply generously. Coverage depends upon absorption and porosity of floor—1 gallon of solution per 100 square feet of floor is average requirement.

3. Use brush, broom or rubber squeegee to move *Saniseal* solution over the surface of the floor to assure uniform distribution.

4. When chemical action (as indicated by foaming) stops, flush or hose the floor with fresh, clean water.

Porous Floors—Two or Three Coat Treatment:

1. Prepare a half-strength solution of *Saniseal* by dissolving 1 pound of *Saniseal* in 1 gallon of warm water.

2. Apply *Saniseal* solution, using galvanized sprinkling can. (Note Precautions, below, on "Type of Containers".) Apply generously. Coverage depends upon absorption and porosity of floor—one gallon of solution per 100 square feet of floor is average requirement.

3. As soon as first coat has dried, prepare a full-strength solution, using 2 pounds of *Saniseal* to 1 gallon of warm water. Apply this second coat in the same manner. Coverage varies with porosity of floor—1 gallon of solution per 100 square feet of floor is average requirement.

4. The third coat, if required, should be applied with full strength solution. Coverage will approximate second coat requirement.

5. When chemical action (as indicated by foaming) stops, flush or hose the floor with fresh, clean water. It is generally not necessary to flush the floor between successive coats, but flushing after the final coat is required.

Terrazzo Floors:

Use the two-coat treatment described for porous floors. If white sediment appears on the surface, it may be removed with a carborundum stone.

PRECAUTIONS:

1. New floors should be 30 days old before *Saniseal* is applied.
2. Use of *Saniseal* on floors that are colored—whether integrally or by the dust-coat method—may leave a white deposit which is difficult to remove.
3. *Saniseal* is corrosove to paint. Do not permit *Saniseal* solution to come in contact with painted surfaces, enameled surfaces or marble. If there are painted, varnished or enameled baseboards, or baked enamel fixture bases, the solution should be kept back a few inches to avoid contact.
4. Curing compounds must be removed prior to the application of *Saniseal*. If *Saniseal* is specified on new floors, consideration should be given to other methods of curing to avoid removal operation.
5. *Take precautions to avoid getting Saniseal in the eyes, on skin or on clothing.* Wear rubber gloves and rubber overshoes when applying. POISONOUS IF SWALLOWED! Call physician immediately. *Saniseal* No. 50 and *Saniseal* No. 100 contain fluorine compounds which may hydrolyze to form fluosilicic acid. *Saniseal* No. 200 contains fluorine and sulphate compounds which may hydrolyze to form fluosilicic acid and/or sulfuric acid.

MASTERKURE

For Membrane Curing of Non-Colored Concrete

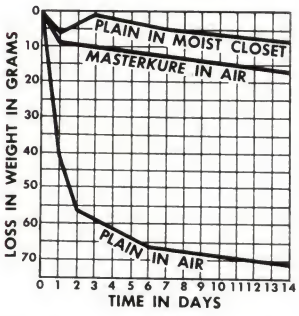
DESCRIPTION:

*MasterKure** is a solution of synthetic resin in a suitable organic solvent. When brushed or sprayed over fresh concrete, the solvent evaporates, depositing a hard, tenacious film that seals in the moisture, permitting more complete hydration of the cement and the development of higher strength concrete. *MasterKure* gives concrete an amber or yellowish cast.

WHERE USED:

MasterKure is recommended for curing all non-colored concrete surfaces, since retention of moisture at an early age and development of strength are essential to making good concrete. It is particularly desirable for use on vertical surfaces where covering with damp burlap or curing paper and continual spraying with water present difficult or costly operations. *MasterKure* is suitable for both indoor and outdoor use.

ADVANTAGES OF *MASTERKURE:*



1. RETAINS MOISTURE: Brings laboratory moist closet conditions to the job site. See chart at left.

2. DEVELOPS STRENGTH AND MINIMIZES DUSTING: Only by retaining moisture can design strengths be met. In floor work, the development of full strength provides maximum abrasion resistance, thus preventing surface dusting. 50% of abrasion resistance can be lost by failing to cure a concrete floor.

3. SINGLE OPERATION: Apply it once; then forget it. Eliminates repeated trips back to job site for spraying with water, dampening burlap, etc.

4. EARLY APPLICATION: Apply *MasterKure* while men are still on job site. Eliminates forgetting this important curing operation. Brush or spray onto concrete as soon as it is sufficiently hard so as not to be marred by application. Use of a spray permits earliest possible application.

5. ECONOMICAL: Costs less than labor cost of sprinkling or ponding; and troublesome coverings such as burlap, paper, moist sand and sawdust are entirely eliminated. The cost of applying *MasterKure* is low compared to the expense of repeated operations involved in other curing methods.

ESTIMATING DATA:

Covering capacity depends on texture and porosity of surface and the

**Registered trademark.*

method of application. Approximate coverage for efficient curing with *MasterKure* is 300 sq. ft. per gallon if sprayed and 400 sq. ft. per gallon if brushed. Note: Several Federal Agencies require membrane curing compounds be applied at a rate of 200 sq. ft. per gallon and that two coats are applied to vertical surfaces.

PACKAGING:

1, 5 and 55 gal. containers.

FREIGHT CLASSIFICATION:

Concrete Surface Curing Compound.

STANDARD SPECIFICATION:

Concrete shall be cured with *MasterKure,* using one gallon per 300 square feet if sprayed, or 400 square feet if brushed, in strict accordance with the directions of the manufacturer, The Master Builders Company.

RELATED PRODUCT:

KUROWAX*—Curing and maintenance wax for colored concrete floors.

DIRECTIONS:

Apply immediately after the exposed surface has sufficiently hardened to prevent marring by the treatment. This is especially important in warm or hot temperatures.

For formed surfaces, apply as soon as the forms are removed.

If any part of the surface has been allowed to dry out, it must be thoroughly wet down immediately preceding the *MasterKure* application, but do not apply *MasterKure* while free water remains on the surface. Quick drying will be particularly noticeable in areas which are exposed to drafts, excessive heat, etc.

Apply by brush or spray, as uniformly as possible. Avoid overlapping.

If brush is used, employ a wide, soft bristle applicator. Material may be poured onto flat surfaces before brushing, but only in a quantity which can be immediately brushed out.

If spraying equipment is used, it should be of a type and size which will readily handle the material. The pressure pot capacity should be at least 10 gallons except where garden-type hand spray tanks are employed. (For best results, we recommend any of the following DeVilbiss Sprayers, or equivalent type: M.B.C., G.D., G.D.S.; equipped with any of the following Caps: No. 95, No. F110-70, No. 2, No. 30; and any of the following Nozzle Tips: E, F, FX.)

Do not add thinner, but be sure contents are carefully stirred to insure thorough mixing. Keep container tightly covered at all times when not in use.

SOLVENTS FOR *MASTERKURE*:

For cleaning equipment or removing *MasterKure* from workmen's

**Registered Trademark.*

hands, any high solvency naphtha or aromatic petroleum solvent may be used. These solvents are flammable and proper precautions should be exercised.

PRECAUTIONS:

1. *MasterKure* is combustible. Keep away from heat and open flame.

2. At low temperatures, *MasterKure* will thicken, but this will not adversely affect its quality. Allow the *MasterKure* to remain at normal room temperature for at least 24 hours, followed by mild but thorough mixing prior to application.

3. Keep container tightly covered at all times when not in use.

4. *MasterKure* is not recommended for curing colored floors, since to maintain a colored floor with wax, the *MasterKure* must be removed. To eliminate this operation use *Kurowax.*

5. *MasterKure* must be removed before any paint or cementing material for tile is applied to the surface.

6. Upon aging, *MasterKure* wears off under traffic and temporarily may give the appearance of a dusting floor. If dust is objectionable, remove *MasterKure* with a flush-off type paint remover at the end of the curing period.

7. *MasterKure* should not be used on static-disseminating and conductive floors.

KUROWAX

Cures, Colors and Waxes Colored Concrete Floors

DESCRIPTION

*Kurowax** provides early and complete curing of newly constructed colored concrete floors. It also enhances, protects and preserves the beauty of new and old colored concrete floors. *Kurowax* makes cleaning simple and inexpensive because it seals the pores with a hard, wear-resistant, water-resistant and stain-resistant coating.

WHERE USED:

For curing new and maintaining existing colored concrete floors—such as Colored *Masterplate** and *Colorcron**. For interior and exterior colored floors, bases, coves, risers, stairs, etc. (Note: Waxes increase the slipperiness of floors and pigments increase visual tracking tendencies . . . these should be considered before applying *Kurowax* in certain areas.

ADVANTAGES OF *KUROWAX:*

1. CURES CONCRETE: When applied to a freshly placed colored concrete floor, *Kurowax* seals in moisture to produce efficient curing. It aids in developing full concrete strength and assists in producing a hard-surface. It also helps protect the floor from dirt or stains during subsequent construction.

2. ELIMINATES COSTLY OPERATIONS:

Since *Kurowax* is both a curing compound and a wax, there is no need to remove it after curing, as is the case with some curing compounds. The waxed floor need only be cleaned, then buffed.

3. IMPROVES COLOR AND APPEARANCE: *Kurowax* eliminates unevenness of color resulting from irregular finishing . . . the entire area attains the same color intensity. *Kurowax* buffs to a satin-like sheen providing long-lasting beauty. Periodic rewaxing maintains beauty.

4. EASY TO USE: *Kurowax* is ready for use as it comes from the container. By using a long-handled *mohair* roller coater and pan, the application is simple and fast. A *thin,* uniform coat of *Kurowax* spreads easily and assures thorough coverage.

5. WEAR-RESISTANT: *Kurowax* protects surface from traffic wear.

6. EASY UNDER FOOT: *Kurowax* takes away the abrasive feel that often makes plain concrete floors disagreeable or tiring.

COLORS:

Tile Red, Seal Brown, Battleship Gray, Persian Red, Tan, French Gray, Terra Cotta, Black, Maroon, Coral Gables Beige and Nile Green. (See Color Chart—Page 2)

ESTIMATING DATA:

1 pound—covers approximately 120 square feet (depends upon smoothness of surface).

**Registered trademark.*

PACKAGING:

U. S. A. — 7-pound and 30-pound containers.
Canada — 9-pound and 35-pound containers.

FREIGHT CLASSIFICATION: Buffing Compound, N.O.I.B.N.

STANDARD SPECIFICATION:

As soon as the colored concrete floor will not be marred by the application, the surface shall be evenly coated with *Kurowax* of the same color as the floor, applied in strict accordance with the directions of the manufacturer, The Master Builders Company.

DIRECTIONS:

A. CURING NEW COLORED CONCRETE FLOORS

1. Early application of *Kurowax* should be made to new, colored concrete floors to obtain maximum curing efficiency and to protect the surface from being soiled. Apply *Kurowax,* in the matching color, as it comes from the can with a short nap *mohair* roller-coater as soon as the floor surface has hardened sufficiently so it will not be damaged or marred by the application. The surface can be damp but should have no free water on it.

2. A thin and even application is very important. One pound should cover 120 square feet, depending upon smoothness of finish. Roll a *thin* coating of *Kurowax* on the main floor area using the *mohair* roller-coater. Avoid roller marks by making the last pass with the roller a light one. Apply *Kurowax* with a small brush or rag around the perimeter to avoid smearing or splashing on walls adjacent to the floor.

3. Let *Kurowax* dry (about an hour) then cover with non-staining paper or polyethylene sheeting to protect the floor from dirt, paint or plaster. (This covering may be omitted if traffic and other trades are not allowed on floor prior to polishing.)

4. Polishing should not be attempted until floor has attained sufficient strength to withstand this operation without damage.

5. Do not polish floor until ready for service. At that time, remove paper, wipe dust from the floor . . . when clean, polish with a soft bristle electric polisher or weighted polishing brush.

6. If surface is stained or dirty upon removal of paper, wash with a mild detergent (Tide, Fab, Vel), rinse, and allow floor to become completely *dry.* Examine the floor for any damage to, or partial removal of *Kurowax.* If a substantial amount of *Kurowax* has been lost, it should be re-waxed, allowed to dry and then polished.

B. WAXING EXISTING COLORED CONCRETE FLOORS

1. This is a maintenance operation and should be done from time to time as appearance requires.

2. *Kurowax* Floors may be cleaned with a mild detergent (Tide, Fab, Vel). This cleaning will not remove the *Kurowax.* Stubborn stains, oil, grease or clear wax coatings other than *Kurowax* may require scrubbing with a foaming cleanser (Ajax, Babo, Swift). (To *completely* remove *Kurowax,* see bottom of next page.)

3. Rinse with clean water until no detergent or cleanser remains on floor.

4. When floor is completely dry, apply a *thin* coat of *Kurowax* with a short-nap *mohair* applicator.

5. A *thin* and *even* application is mandatory. One pound should cover about 120 square feet depending upon smoothness of surface.

6. Let dry, then polish with soft bristle electric polisher or weighted polishing brush.

PRECAUTIONS:

1. *Kurowax* is a combustible mixture. Keep it away from fire or open flame.

2. To bring *Kurowax* to room temperature before applying, do not subject it to temperatures higher than 120°F.

3. Make sure that *Kurowax* is applied in a thin coat. Heavy coats will increase tracking.

4. Use only the proper applicator . . . a short-nap *Mohair* roller-coater. Do not use a lambs wool applicator.

5. Do not allow repeated coats of *Kurowax* to build up, one on the other. See section below or contact your nearest Master Builders branch office for information on how to remove *Kurowax.*

6. Though *Kurowax* is extremely durable under traffic and repeated cleaning there is the possibility of tracking. This should be considered before using *Kurowax* adjacent to light colored floors.

7. Though *Kurowax* contains anti-slip compounds, a floor treated with *Kurowax* is less slip-resistant than a floor without wax on it.

TO COMPLETELY REMOVE *KUROWAX* FROM FLOORS

The exceptional durability of *Kurowax* necessitates a special procedure for the complete removal of it from the floor. If it becomes necessary or desirable to remove the *Kurowax,* follow this procedure.

1. Apply *undiluted* "Lestoil" with a mop or a squeegee. (Lestoil is a household liquid cleanser obtainable in most grocery stores.)

2. Allow Lestoil to remain undisturbed on the floor for 5 to 10 minutes, or until *Kurowax* softens.

3. Scrub floor which will put the softened *Kurowax* into an emulsion. A rotary type scrubbing brush machine can be used to advantage. At this point, add water in order to facilitate removal of this highly colored liquid. Care should be taken, particularly with a rotary machine, that it does not cast the colored liquid onto bases or walls of the room.

4. Thoroughly rinse the floor with clean water.

5. Since Lestoil softens *Kurowax* it is very important that every trace of it be removed from the floor and surrounding area before re-waxing is attempted. Use a *final* washing with a foaming cleanser such as Ajax, or Swift to remove all of the Lestoil. This washing should be followed with a good rinsing with clear water and allowed to become completely dry.

6. When dry, re-wax and polish as in previous described sections.

**Registered trademark.*

KONDUCTOKURE

The Conductive Membrane Curing Compound for Curing D P S Masterplate Floors

DESCRIPTION:

*Konductokure** is made of hard resinous wax suspended in a resinous-type conductive membrane curing compound. *Konductokure* keeps the moisture sealed into the surface for the curing period. At the conclusion of the curing period it need not be removed, but can be polished to a wax-like finish.

WHERE USED:

For curing static-disseminating, spark-resistant concrete floor surfaces such as *D P S Masterplate.* Ordinary membrane curing compounds insulate the surface and prevent static charges from being disseminated and should not be used.

ADVANTAGES OF *KONDUCTOKURE:*

1. Cures the Concrete: *Konductokure* is required for curing *D P S Masterplate* floors as an additional protection against contamination, from the deposit on or in the surface, of non-ferrous particles that may become embedded and may produce sparks.
2. This membrane film is a second line of protection under the covering paper recommended.
3. *Konductokure* can be polished to a wax-like finish and can be rewaxed with *Konductowax.* Ordinary membrane curing compounds insulate the surface and prevent static charges from being disseminated—they must never be used for curing *D P S Masterplate* floors.
4. Easy to apply: No special equipment is required. Excellent results are obtained by following simple directions.

COLORS:

Dark Gray.

COVERING CAPACITY:

When brushed — approximately 400 square feet per gallon.
When sprayed — approximately 300 square feet per gallon.
Coverage may vary depending upon porosity or texture of floors.
For cleaning equipment or removing material from workmen's hands, any high solvency naphtha or aromatic petroleum solvent may be used. These solvents are flammable and proper precautions should be exercised.

PACKAGING:

5 and 1 gallon containers.

**Registered trademark.*

KONDUCTOKURE

FREIGHT CLASSIFICATION:

Concrete Surface Curing Compound.

STANDARD SPECIFICATION: *(Konductokure)*

The *D P S Masterplate* floor shall be cured with *Konductokure* using one gallon per 300 sq. ft. of sprayed, or 400 sq. ft. if brushed exactly according to the directions of the manufacturer, The Master Builders Company.

PRECAUTIONS:

Because of the extreme importance of Static-Disseminating and Spark-Resistant floors, the following must be observed carefully:

1. Before applying *Konductokure,* the floor should be brushed clean of all loose dirt, grit, and any type of material that might impair conductivity or cause frictional sparks.
2. The *Konductokure* should be thoroughly mixed immediately before application.
3. Care must be taken to produce a continuous and uniform film on the floor.

RELATED PRODUCTS:

DPS MASTERPLATE* — Ready-to-use dust coat material for producing static-disseminating, spark-resistant, and heavy duty iron clad floors.

KONDUCTOWAX* — the liquid conductive wax for maintaining *Konductokured* floors.

HOW TO APPLY:

Apply as soon as the surface is hard enough to prevent marring under the treatment. This should be done on the same day the surface is finished — soon after the final troweling.

If any part of the surface has been allowed to dry out, it must be thoroughly wet down with water preceding the *Konductokure* application, but do not apply *Konductokure* while free water remains on the surface. Quick drying will be particularly noticeable in areas which are exposed to draughts, excessive heat, etc. Apply by brush or spray, as thinly and uniformly as possible. Avoid overlapping.

If brush is used, employ wide soft bristle type applicator. Use a pan or pail into which the brush can easily be dipped. Material may be poured on to flat surfaces before brushing, but care must be exercised to insure even distribution and only a quantity which can be immediately brushed out should be placed on the surface at one time.

If spraying equipment is used, it should be of a type and size which will readily handle the material. The pressure pot capacity should be at least 10 gallons except where hand spray outfits are employed.

Do not add thinner to *Konductokure.*

Keep container tightly covered at all times when not in use.

**Registered trademark.*

KONDUCTOWAX (Concentrated)

The Conductive Wax for Protecting and Preserving Static-Disseminating and Spark-Resistant Concrete Floors

DESCRIPTION:

*Konductowax** is a water emulsion of hard, wear-resisting wax with fine stable color pigment to enhance the beauty of the dark colored *D P S Masterplate* floor. It fills and seals the pores with a water resistant, stain resistant and anti-slip film that keeps the surface clean and makes upkeep simple and inexpensive. The *Konductowax* film is conductive in itself and repeated applications do not reduce electrical conductivity.

Konductowax is compatible with *Konductokure* and is designed for application over floors cured with *Konductokure* without necessitating removal of the curing compound.

WHERE USED:

Konductowax is especially designed for use on *D P S Masterplate* static-disseminating and spark-resistant floors. Waxed floors in hazardous areas reduces hazard by facilitating cleaning or mopping of dusts, powders or liquids from the surface and promotes all around good housekeeping.

Konductowax can be readily removed by steam cleaning and commercial dewaxing compounds therefore compliments the Ordnance Department practice of removing the wax at monthly intervals to rid the surface of explosive or inflammable dusts.

ADVANTAGES OF *KONDUCTOWAX:*

1. CONDUCTIVITY—the *Konductowax* film itself is electrically conductive and repeated application does not reduce or impair the conductivity of the floor. Other so-called conductive waxes form insulating films which reduce conductivity or in the event repeated application or a single heavy application on the same area the resultant reduction in conductivity may constitute a serious explosion or fire hazard.

2. WEAR-RESISTANT—protects surface from traffic wear. Need for reapplication is less frequent.

3. SKID-RESISTANT—contains anti-slip compounds to minimize slipperiness.

4. Promotes good housekeeping in areas where preservation of life and property depend upon cleanliness and orderliness. Makes floor easy to clean, brush or mop to free surface of explosive dusts, powders and liquids.

5. Shipment and storage of *Konductowax* in concentrated form saves money and space; water is added when material is used. Failure to add water does not impair conductive qualities.

**Registered trademark.*

KONDUCTOWAX

COLORS:

Dark Gray.

COVERING CAPACITY:

Konductowax must be diluted: Mix 2 volumes of water with one volume of *Konductowax* and stir well before using.

For average floors one gallon of *Konductowax* diluted with 2 gallons of water will cover 1500 to 2400 sq. ft. Extremely dry, rough or porous floors have lower coverage; dense, smooth floors have higher coverage.

PACKAGING:

5 and 1 gallon containers.

FREIGHT CLASSIFICATION:

Buffing Compound, NOIBN.

STANDARD SPECIFICATION:

The D P S Masterplate floor shall be waxed with *Konductowax,* the conductive floor wax, 1 gallon diluted with 2 gallons of water per 1500 to 2400 sq. ft., one coat in strict accordance with the directions of the manufacturer, The Master Builders Company.

PRECAUTIONS:

Because of the extreme importance of Static-Disseminating and Spark-Resistant floors the following must be observed carefully:

1. Before applying the *Konductowax,* the floor should be brushed clean of all loose dirt, grit, and any type of material that might impair conductivity or cause frictional sparks.
2. *Konductowax* must be diluted with water before using.
3. The *Konductowax* should be thoroughly mixed immediately before application.
4. Care must be taken to produce a continuous and uniform film on the floor.
5. Protect *Konductowax* from freezing temperatures in transit or in storage prior to applying. If frozen, thaw and stir well before using.
6. Floors laid directly on the ground cannot be waxed unless they resist penetration of water beneath. To determine the dryness of a floor lay rubber mats or pieces of linoleum at several spots on the floor for 24 hours. If moisture collects beneath the mats the floor should not be waxed.

RELATED PRODUCTS:

*D P S MASTERPLATE**—Ready to use dust-coat material for producing static-disseminating, spark-resistant, and heavy duty iron clad floors.

*KONDUCTOKURE**—the conductive membrane curing compound.

**Registered trademark.*

HOW TO APPLY *KONDUCTOWAX:*

The surface to be treated should be thoroughly clean and damp — but with no free water on the surface. DILUTE THE *KONDUCTOWAX*— 2 VOLUMES OF WATER TO 1 VOLUME OF *KONDUCTOWAX.* STIR WELL. Apply a coat of *Konductowax* with a soft bristle brush or sheepskin applicator. Brush out to a thin, uniform finish. Do not brush fresh *Konductowax* over an area that has already been covered and is dry—if you do, wipe it off—OVERLAPPING PRODUCES STREAKS THAT ARE DIFFICULT TO POLISH AWAY. As soon as the wax is completely dry, polish with stiff bristle brush by hand or with a machine using fibre bristle brushes as directed below.

On large areas, it is recommended that polishing be with a 150 lb. or heavier polishing machine, such as a Kelly Floating Machine or Ponsell Model "A". Use stiff clean FIBRE bristle brushes.

Konductowax may be applied over *Konductokure,* but must not be applied over a non-conductive membrane curing compound.

One coat as applied above is sufficient for the average floor. Under some conditions two coats may be required.

HOW TO MAINTAIN FLOORS FINISHED WITH *KONDUCTOWAX*

Floors subject to constant traffic should be brushed clean with dry brooms daily. These floors may be scrubbed with strong cleaners and machine scrubbers when they become extremely dirty. Another coat of *Konductowax* may be applied at long intervals as previously described.

HOW TO REMOVE *KONDUCTOWAX:*

Steam cleaning removes *Konductowax* from the floor. Solvents for removing *Konductowax* are Benzol, Toluol, Xylol, Solvesso or similar aromatic solvents. (WARNING—these solvents are inflammable.)

GROUTING HEAVY EQUIPMENT

PROTECTION & RESTORATION OF CONCRETE AND MASONRY

INTRODUCTION

In grouting heavy equipment, the space between bedplate and foundation is usually irregular, intricate and inaccessible. To completely fill the space, a flowable mix is generally used. However, the water, which imparts to plain grout the one advantage of workability, at the same time imparts the disadvantages of shrinkage, slow hardening and low strength. The use of Master Builders' grouting materials overcomes these disadvantages.

In the protection or restoration of concrete structures, the success of the operation depends primarily on the elimination of shrinkage. The Master Builders Company has developed materials for eliminating shrinkage so as to make lasting repairs a matter of habit rather than one of luck.

The successful application of protective treatments to concrete and masonry surfaces presents highly specialized problems. There are many and varied conditions which exist, each demanding a specific treatment (method and material). As a result of many years of field and laboratory experience, The Master Builders Company has developed proved methods and materials for dealing with many of these problems.

For any type of work—restoration, grouting or protection—as much as 95% of the cost is represented by labor, and the success of the job should not be jeopardized by the use of inferior materials and short-cut methods.

EMBECO

A Group of Products for Producing Non-Shrink Grout, Concrete and Mortar

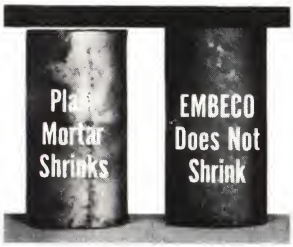
*Embeco** catalyzed metallic aggregate, used successfully for more than 30 years, provides a job-proven material and method for producing non-shrink grout, concrete and mortar of great strength and density.

Embeco counteracts shrinkage and lowers permeability of concrete and mortar because:

(a) Less water is required for a given workability, resulting in higher strength and lower initial shrinkage.

(b) The void-filling action of its specially prepared iron aggregate and other components compensates for the inherent shrinkage of concrete and mortar.

Water is the cause of shrinkage and permeability:



All plain concrete and mortars shrink upon hardening — the excess water evaporates from the mix during setting and hardening, causing volume change and shrinkage stresses. *Embeco* completely counteracts shrinkage because the void-filling action of its specially-prepared iron aggregate and other components compensates for the inherent shrinkage of concrete and mortar. All concrete is permeable—the degree of permeability is dependent upon the amount of excess water in the mix. Water leaves the mix, creating pores and capillaries; water enters the hardened concrete through these same pores and capillaries. *Embeco* lowers permeability primarily because it fills the voids and seals the surface.

Action of Embeco in concrete and mortar:

1. Controlled enlargement of the iron aggregate in *Emberco* produces a void-filling action that offsets the shrinkage caused by water leaving the concrete or mortar mix.

2. The void-filling action of *Embeco* seals off capillaries and densifies the concrete and mortar and seals off pores on the surface of the concrete.

3. Iron particles are ductile and withstand considerable impact without shattering. Similarly, mortars treated with *Embeco* resist shattering. This is especially important in grouting heavy equipment, where impact, pounding action and vibration are part of the normal operation of the machine.

4. *Embeco* reduces the amount of water required for a given workability. Less water means less shrinkage for the iron aggregate to correct.

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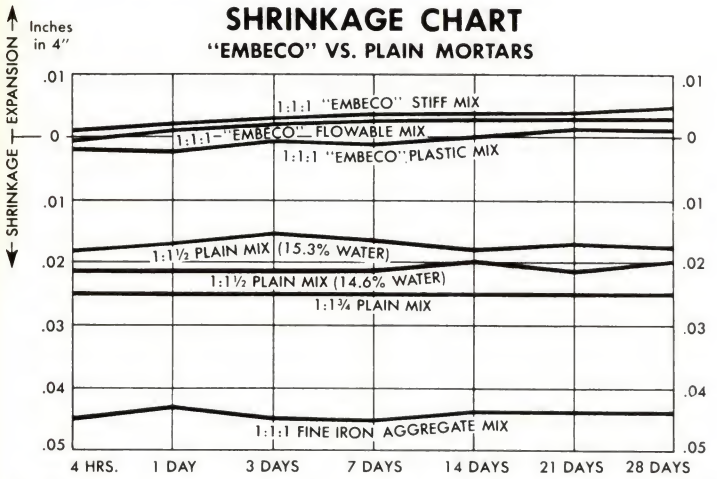
5. Less mixing water also means lower water-cement ratio and higher strength concrete and mortar. *Embeco* is also an accelerator, producing higher early and ultimate strengths.



Note: Tests were conducted on unconfined mortars. Had the specimens been confined, as in grouting applications, the EMBECO mortar would have no expansion, while the other mortars would shrink.

READY-TO-USE FORMULATIONS (Requiring mixing with water only):

EMBECO PRE-MIXED GROUT:

Ready-to-use formulation specifically designed and recommended for non-shrink grouting of machinery, heavy equipment, anchor bolts, building columns and bridge seats.

EMBECO PRE-MIXED MORTAR:

Ready-to-use formulation specifically recommended for making non-shrink repairs to concrete and for certain applications requiring a watertight, non-shrink mortar.

JOB-MIX FORMULATIONS (Requiring mixing with carefully selected cement and aggregate at the job site):

EMBECO AGGREGATE:

Recommended as an additive for a variety of applications wherever non-shrink grout or mortar is required. Use as directed for the specified application.

EMBECO NO. 5:

A very fine gradation. Recommended only for brush coat waterproofing, tile setting with joints ¼" or less, or pressure grouting with close clearances.

EMBECO Pre-Mixed Grout

Ready-to-Use Non-Shrink Grout

DESCRIPTION:

*Embeco** Pre-Mixed Grout is a ready-to-use product which contains specially-prepared iron aggregate, laboratory-tested cement, sand specifically formulated for grouting purposes, and Master Builders' water-reducing agent and other exclusive technical components which improve the properties of the hardened grout.

WHERE USED:

Grouting equipment and machinery
Setting anchor bolts
Setting building columns
Setting steel columns
Setting bearing plates and bridge seats
. . . and similar operations where the grout is confined and where settlement shrinkage and drying shrinkage must be counteracted.

ADVANTAGES OF *EMBECO* PRE-MIXED GROUT:

Embeco Pre-Mixed Grout produces uniformly superior results, regardless of job location or suitability of local materials. Factory production, under laboratory supervision, results in a uniform product which serves to better control many factors affecting the quality of the finished application.

Use of *Embeco* Pre-Mixed Grout gives assurance that:

1. The proper type of cement is employed—a quality-tested, non-air-entraining normal portland cement.

2. A scientifically-graded, clean, sharp, silica sand is employed . . . a gradation specifically formulated for grouting from 5 sand fractions.

3. The components of *Embeco* Pre-Mixed Grout are carefully proportioned to produce a non-shrink mix specifically designed for grouting.

4. All ingredients are thoroughly blended, so that only the addition of water is needed at the job site.

Importance of sand in grouting:

Sand used in grouting is all-important. A poorly-graded sand may cause bleeding and water pockets between the bedplate and grout. These

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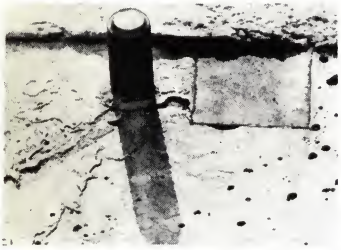
water pockets dry out and result in insufficient contact between the bedplate and grout — often as little as 5% to 10% contact. In many cases, the bearing is on the shims only. A poorly-graded sand also may raise water requirements needed to produce a flowable mix and thus increase shrinking and reduce strength.

The sand in *Embeco* Pre-Mixed Grout is specifically formulated for grouting by combining 5 different sand fractions in our factory. This special grading minimizes bleeding and reduces the water requirement for a flowable mix.



Plain grout shrinks, leaving only a web of mortar and small shim area to support the equipment.

Grout made with EMBECO is non-shrink. It provides full bedplate support; maintains alignment.

BENEFITS OF USING *EMBECO* PRE-MIXED GROUT:

Of particular importance to the user—the contractor, the owner's maintenance man or labor foreman, etc.:

1. CONVENIENCE AND EASE OF USE: No selecting, assembling or proportioning of ingredients. A minimum of necessary supervision. Storage at the jobsite is simplified . . . problems related to sand with variable moisture content, or lumps of frozen sand, etc., are eliminated by *Embeco* Pre-Mixed Grout.

2. TIME SAVING: Actual job studies show that *Embeco* Pre-Mixed Grout effects time savings up to 50% . . . on both large and small jobs.

3. EASE OF TRANSPORTING AND HANDLING AT THE JOB SITE: Substantial savings result because only one material need be handled.

Of particular importance to the man responsible for the results — engineer, owner, etc.:

1. GREATER CONTROL OVER THE RESULTS: Greater control over many aspects affecting the quality of the finished job.

2. ASSURANCE OF TOP RESULTS: Only the best ingredients are used and all ingredients are combined accurately.

ESTIMATING DATA:

1. One 100 lb. bag or pail of *Embeco* Pre-Mixed Grout with 1.8 gals. of water yields approximately 0.7 cubic feet of grout.

2. For a cubic yard of flowable grout, estimate 3800 lbs. of *Embeco* Pre-Mixed Grout.

3. For 100 sq. ft. of flowable grout 1″ thick, estimate 1200 lbs. of *Embeco* Pre-Mixed Grout.

In estimating grouting requirements be sure to make ample allowance for material that is needed to place the grout properly, including grout for "head", additional grout in forms around bedplate, grout for the anchor bolts, etc.

Where free passage of grout will not be obstructed by coarse aggregate in the mix (generally 2-inch or greater clearance between bedplate and foundation) 50 lbs. of ¼″ to ⅜″ pea gravel or stone may be added to each 100 lbs. of *Embeco* Pre-Mixed Grout. Yield is approximately 1.0 cu. ft. for the 150 lbs. of mix, using about 2 gals. of water. Note: This mix is available as a ready-to-use product. Ask for Special *Embeco* Pre-Mixed Grout with ⅜″ Aggregate.

PACKAGING:

In 100 lb. polyethylene-lined cloth bags and 100 lb. (6 gal.) steel pails.

STORAGE:

The quality of *Embeco* Pre-Mixed Grout is unaffected by storage for as long as 1 year in bags and 2 years in pails, with dry storing conditions.

FREIGHT CLASSIFICATION:

Cement Compound, Building or Floor, Dry.

RELATED PRODUCTS:

SPECIAL *EMBECO* PRE-MIXED GROUT with ⅜″ AGGREGATE
***EMBECO* PRE MIXED MORTAR**
***EMBECO* AGGREGATE**

DIRECTIONS:

See following pages for directions on specific applications.

NOTE:

When specifying ready-to-use *Embeco* grout, use the full name, *Embeco* Pre-Mixed Grout.

EMBECO Pre-Mixed Mortar

Ready-to-Use Non-Shrink Mortar

DESCRIPTION:

*Embeco** Pre-Mixed Mortar is a ready-to-use product which contains specially-prepared iron aggregate, laboratory-tested cement, sand specifically formulated for the recommended applications, Master Builders' water-reducing agent and other exclusive technical components which improve the properties of the hardened mortar.

WHERE USED:

For successful non-shrink repair of concrete and masonry—keeps water out.

Patching horizontal concrete surfaces
Patching vertical concrete surfaces
Caulking seam between floor slab and wall
Grouting around pipes through walls
Caulking pipe joints
Repairing joints of brick and tile floors

. . . and similar repairs of areas no greater than one foot in diameter and about 1″ in depth where the effectiveness depends on reducing or eliminating drying shrinkage and lineal shrinkage. *Embeco* Pre-Mixed Mortar need not be confined.

For holes over one foot in diameter and more than 1 inch deep, 50 pounds of ¼″-⅜″ clean pea gravel or stone can be added per 100 pounds of *Embeco* Pre-Mixed Mortar.

ADVANTAGES OF *EMBECO* PRE-MIXED MORTAR:

Embeco Pre-Mixed Mortar produces uniformly superior results. Factory production, under laboratory supervision, results in a uniform product which serves to better control many factors affecting the quality of the finished application.

Use of *Embeco* Pre-Mixed Mortar gives assurance that:

1. The proper type of cement is employed—a quality-tested, non-air-entraining normal portland cement.

2. A scientifically graded, clean, sharp silica sand is employed . . . a gradation specifically formulated for the recommended applications.

COMPRESSIVE STRENGTH (Lbs. per sq. in.)		
Based on 2" x 2" cubes made with same plastic consistency. Average of three breaks for each figure. Cured at 70° F.		
Time	"Embeco" Pre-Mixed Mortar	Plain 1:2 Cement-Sand Mortar
3 hrs.	120	0
12 hrs.	2840	635
24 hrs.	4400	1475
3 days	7950	3380
7 days	9695	4450
28 days	11585	6535
"Embeco" Pre-Mixed Mortar also produces high flexural strengths. Typical flexural strength test results show 630 p.s.i. at 24 hrs., and 1180 p.s.i. at 7 days for a plastic, easily placed consistency.		

3. The components of *Embeco* Pre-Mixed Mortar are carefully proportioned to produce a non-shrink mix specifically designed for the recommended applications.

4. All ingredients are thoroughly blended, so that only the addition of water is needed at the job site.

BENEFITS OF USING *EMBECO* PRE-MIXED MORTAR:

Of particular importance to the user—the contractor, the owner's maintenance man or labor foreman, etc.:

1. CONVENIENCE AND EASE OF USE: No selecting, assembling or proportioning of ingredients. A minimum of necessary supervision.

2. TIME SAVING: Actual job studies show that *Embeco* Pre-Mixed Mortar effects time savings up to 50% . . . on both large and small jobs.

3. EASE OF TRANSPORTING AND HANDLING AT THE JOB SITE: Substantial savings result because only one material need be handled.

Of particular importance to the man responsible for the results — engineer, owner, etc.:

1. GREATER CONTROL OVER THE RESULTS: Greater control over the quality of the finished job.

2. ASSURANCE OF TOP RESULTS: Only the best ingredients are used and all ingredients are combined accurately. *Embeco* Pre-Mixed Mortar therefore makes possible non-shrink repairs that are strong, dense, tough and resistant to water penetration.

EMBECO PRE-MIXED MORTAR

ESTIMATING DATA:

100 lbs. of *Embeco* Pre-Mixed Mortar will produce approximately .75 cu. ft. or 1300 cu. in. of plastic mortar. 70 lbs. will produce about .52 cu. ft. or 900 cu. in. of plastic mortar.

For holes over one foot in diameter and more than 1 inch deep, where 50 pounds of ¼"-⅜" clean pea gravel is added per 100 pounds of *Embeco* Pre-Mixed Mortar, the yield is approximately 1.0 cu. ft. of plastic mortar.

PACKAGING:

100 lb. polyethylene-lined cloth bags and 70 lb. (5 gal.) steel pails.

STORAGE:

Embeco Pre-Mixed Mortar is unaffected by storage for as long as 1 year in bags and 2 years in pails with dry storing conditions.

FREIGHT CLASSIFICATION:

Cement Compound, Building or Floor, Dry.

RELATED PRODUCTS:

SPECIAL *EMBECO* PRE-MIXED GROUT with ⅜" AGGREGATE
***EMBECO* AGGREGATE**

DIRECTIONS:

1. Apply *Embeco* Pre-Mixed Mortar only to clean, sound surfaces.

2. Before making repairs to concrete, it is necessary to saturate the old concrete thoroughly with clear water. Saturation is needed to prevent the old concrete from absorbing water from the new mortar. Remove excess water before applying the bond coat.

3. Where a bond coat is indicated, dust on dry *Embeco* Pre-Mixed Mortar. Scrub in thoroughly around edges and surface, including adjacent areas. Do not allow the bond coat to dry out before placing the mortar.

4. The amount of water to be used with *Embeco* Pre-Mixed Mortar varies with the intended application and also with climatic conditions such as temperatures, etc. Listed below are approximate water requirements to produce the desired consistencies.

Consistency	Water for 70 lbs. Pail of EMBECO Pre-Mixed Mortar	Water for 100 lbs. Bag of EMBECO Pre-Mixed Mortar
Stiff	.9 gals.	1.3 gals.
Plastic	1.1 gals.	1.5 gals.
Flowable	1.4 gals.	1.9 gals.

Water quantities shown in standard U.S. gals.
Adjust accordingly for Imperial and Metric measure.

5. Do not mix at one time more *Embeco* Pre-Mixed Mortar than can be used in approximately 20 minutes under normal conditions of temperature, etc. Once the mortar has taken its initial set, do not re-temper by adding more water.

6. Curing should be done, where called for, by keeping the surface of the repaired area continually wet for three or more days. Curing should be started as soon as the mortar has hardened.

IMPORTANT: Oxidation of the iron aggregate on the surface, if objectionable, can be overcome or prevented by: (1) painting with a cement-base paint after oxidation is complete; (2) floating a ⅛" coating of 1:2 (by weight) cement-sand mortar into the surface of the plastic *Embeco* Pre-Mixed Mortar; (3) applying a dry shake of the 1:2 cement-sand mixture (or Master Builders Non-Colored *Colorcron)* over the plastic *Embeco* Pre-Mixed Mortar and floating moisture through, then finishing in the desired manner.

The cement-paint treatment is generally used when the entire concrete surface surrounding the repairs is being painted. The wet mortar coating is advisable for vertical surfaces and the dry shake mortar coating for horizontal surfaces.

NOTE:

When specifying ready-to-use *Embeco* mortar, use the full name, *Embeco* Pre-Mixed Mortar.

EMBECO Aggregate

For Counteracting Shrinkage and Reducing Permeability

DESCRIPTION:

*Embeco** Aggregate is an exclusive, scientifically formulated, catalyzed metallic aggregate, containing a water-reducing agent and other special ingredients. When added in the proper proportion to concrete and mortar mixes, shrinkage is counteracted and other basic qualities are improved.

Embeco Aggregate is mixed on the job site with carefully selected concrete sand, portland cement and water, to produce a non-shrink grout, concrete or mortar of great strength and density. *Embeco* Aggregate is also used as a foundation treatment to provide protection against water penetration.

WHERE USED:

To produce non-shrink grout, completely free of settlement shrinkage and drying shrinkage for the precision grouting of equipment and machinery.

To produce non-shrink mortar free of drying shrinkage and lineal shrinkage for:

Repair and reintegration of concrete
Setting and resetting floor brick and tile
Grouting steel floor grids
Gunned mortar

As a foundation treatment, to provide protection against water penetration:

Plastercoating foundations
Brushcoating foundations

PACKAGING:

100 lb. polyethylene-lined moisture-proof cloth bags and 100, 50 and 20 lb. steel pails.

FREIGHT CLASSIFICATION:

Cement Compound, Building or Floor, Dry.

RELATED PRODUCTS

***EMBECO* PRE-MIXED GROUT**
***EMBECO* PRE-MIXED MORTAR**

***EMBECO* No. 5**—A finely graded *Embeco.*

DIRECTIONS:

See following pages for directions for specific applications.

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PRECAUTIONS:

1. Use non-air-entraining Type 1 portland cement and clean, well-graded concrete sand with *Embeco* Aggregate. Where necessary, non-air-entraining Type II cement may be used if it is not slow setting.

2. The amount of *Embeco* Aggregate, cement and sand used in the mix depends upon the purpose for which the mix will be used. Consult the mix designs given on the direction sheet with each container.

3. Accurate proportioning of *Emebco* Aggregate mixes is important—mix designs given are by weight.

4. When mixing less than 100 lbs. of *Embeco* Aggregate at a time, roll the container several times to assure mixing of the ingredients of *Embeco* Aggregate.

5. If the container has been opened to remove a portion of the *Embeco* Aggregate, the container must be protected against moisture, dampness and humidity. Reseal container tightly and store in a dry place.

6. Do not retemper *Embeco* Aggregate mixes. Mix only as much material as can be placed before the mix takes its initial set.

EMBECO® AGGREGATE MIX DESIGNS

ACCURATE PROPORTIONING OF MIX IS IMPORTANT
USE ONLY NORMAL PORTLAND CEMENT WITH EMBECO AGGREGATE

TYPE OF WORK	MIX DESIGN — BY WEIGHT				Mix Consistency	ESTIMATING DATA			
	EMBECO Aggregate	Normal Cement	Sand	¼" - ⅜" Gravel or Stone		EMBECO Aggregate (Lbs.)	Cement (Bags)	(f) Sand (Lbs.)	¼"— ⅜" Gravel (Cu. Ft.)
						For 1 Cu. Yd. Compacted Mortar			
GROUTING MACHINERY (FOR MOST INSTALLATIONS) (a)	1	1	1	—	Plastic to Flowable	1265	12.6	1265	—
FOR USE WHERE FREE PASSAGE OF GROUT IS NOT HINDERED BY PEA STONE IN MIX	1	1	1	1.5	Plastic to Flowable	870	8.7	870	13.1
GROUTING ANCHOR BOLTS (a)	1	1	1	—	Plastic	1265	12.6	1265	—
GROUTING BUILDING COLUMNS (a)	1	1	1	—	Stiff	1265	12.6	1265	—
GROUTING BRIDGE SEATS (a)	1	1	1	—	Plastic	1265	12.6	1265	—
GROUTING STEEL FLOOR GRIDS	¼	1	2	—	Plastic	265	10.6	2120	—
GROUTING AROUND PIPES THRU WALLS (b)	1	2	3	—	Plastic	580	11.6	1750	—
CAULKING BELL AND SPIGOT PIPE (b)	1	2	3	—	Plastic	580	11.6	1750	—
FILLING SEAMS AND CRACKS (NOT OVER 4 INCHES WIDE AND 1 INCH DEEP) (b)	1	2	3	—	Plastic	580	11.6	1750	—
FILLING LARGE HOLES AND CAVITIES OVER 4 INCHES WIDE	15% (e)	1	1	1.5	Stiff	145	10.9	1090	16.3
TUCKPOINTING MASONRY (b)	1	2	3	—	Stiff	580	11.6	1750	—
CAULKING FLOOR JOINTS—SEAMS BETWEEN FLOOR AND WALL (b)	1	2	3	—	Stiff	580	11.6	1750	—
SETTING FLOOR BRICK, DAIRY TILE, QUARRY TILE (c) — Bedding Mix	—	1	3	—	Mealy	Thickness of bed, size and depth of tile, and width of joint must be known. Consult literature for charts on estimating.			
Bond	—	1	—	—	No Water				
Joint Grout	¼	1	—	—	Creamy				
Dryer Mix	¼	1	1	—	No Water				
						For 100 Sq. Ft. 1 Inch Thick			
PATCHING FLOORS, RAMPS, PLATFORMS (HOLES LESS THAN 1 FOOT IN DIAMETER) (b)	1	2	3	—	Plastic	185	3.7	560	—
PATCHING HOLES OVER 1 FOOT IN DIAMETER AND EXTENSIVE AREAS	1	4	6	9	Plastic	60	2.4	350	5.3
PLASTER-COATING SPALLED AREAS NOT OVER 1 INCH IN DEPTH	¼	1	2	—	Plastic	85	3.4	680	—
GUNNED MORTAR APPLICATION	15% (e)	1	3	—	Gunned	40	2.9	880	—
TOPPING MIX FOR RESURFACING FLOORS	20% (e)	1	1.5	1.5	Stiff	55	2.8	420	4.2
						For 100 Sq. Ft. ½ Inch Thick			
PLASTERCOAT FOR FOUNDATION WALLS (INSIDE OR OUTSIDE) — Bond	1	1	—	—	Creamy	16	15 Lbs.	—	—
Plaster	¼	1	3	—	Plastic	35	1.4 Bags	390	—
						For 100 Sq. Ft. of Prepared Surface			
BONDING NEW CONCRETE TO OLD (SLUSH BOND COAT)	1	1	—	—	Creamy	16	15 Lbs.	—	—
BRUSH COAT FOUNDATION TREATMENT (d) First and Third Coats	1	—	—	—	Brushable	10	—	—	—
Second and Fourth Coats	1	3	1	—	Creamy	5	15 Lbs.	5	—

NON-SHRINK CONCRETE—Consult Master Builders field man to assist in modifying the mix with *Embeco* Aggregate and *Pozzolith* for the concrete involved. In the new mix design, *Embeco* Aggregate is considered as a partial replacement for sand (based on absolute volume). Generally *Embeco* Aggregate is added at the rate of one pound for each pound of mixing water in excess of two gallons per bag (94 lbs.) of cement in accordance with the chart above. Use no more than 35 pounds of *Embeco* Aggregate per bag of cement. *Pozzolith* reduces excess water and thus reduces the amount of *Embeco* required.

Mixing Water (gals./94 lbs. cement)	4	4.5	5	5.5	6	6.5
Embeco Aggregate (lbs./94 lbs. cement)	17	21	25	29	33	35

Cover the concrete maybe with a thin coat of cement and sand applied as a parging or stucco, or with at least two coats of cement-water paint. A cement-sand dust coat may be used on horizontal exposed surfaces. Damp cure all areas insofar as possible for the first three days.

Detailed specifications and operational procedures on each of the above uses of *Embeco* are available from The Master Builders Co.

(a) *Embeco* Pre-Mixed Grout is recommended for these uses as it eliminates the necessity of selecting and proportioning materials and assures uniformly consistent results.

(b) *Embeco* Pre-Mixed Mortar is recommended for these uses as it eliminates the necessity of selecting and proportioning materials and assures uniformly consistent results.

(c) Use *Embeco* No. 5 (fine grading) for joints less than ¼" wide.

(d) For open pore (cinder, haydite blocks) surfaces only. Use *Embeco* No. 5 for close pore surfaces.

(e) Percent by weight of cement.

(f) 100 lbs. of dry sand is approximately 1 cubic foot.

Note: To all the above mixes, after turning over enough times to insure even distribution of aggregate and cement, add only enough clean water to make mix placeable. Avoid an excess of water.

On small jobs, a 5-gallon pail can be used for proportioning mixes. The pail holds approximately 70 lbs. dry sand, 50 lbs. portland cement, or 5 gallons water.

EMBECO No. 5

A Finely Graded Embeco for Foundation Treatments, Floor Brick, Pressure Grouting

DESCRIPTION:

*Emebco** No. 5 is specially prepared metallic aggregate, 85 to 100% passing a 60 mesh screen, combined with Master Builders' water-reducing agent and other exclusive technical components which improve the properties of the finished job.

Embeco No. 5 is mixed on the job site with portland cement and water. The void-fiilling action of its iron particles compensates for shrinkage. When scrubbed into masonry surfaces, the void-filling action of the iron particles seals the pores against penetration of water.

WHERE USED:

For brush coat applications to concrete and masonry surfaces
For setting floor brick with joints of ¼" or less
For repairing floor brick joints less than ¼" wide
For pressure grouting with close clearances
These uses of *Embeco* No. 5 are discussed on the following pages.

PACKAGING:

100 lb. moisture resistant cloth bags and 100, 50, and 20 lb. steel pails.

FREIGHT CLASSIFICATION:

Cement Compound, Building or Floor, Dry.

RELATED PRODUCTS:

***EMBECO* PRE-MIXED GROUT**
***EMBECO* PRE-MIXED MORTAR**
***EMBECO* AGGREGATE**

**Registered trademark.*

GROUTING EQUIPMENT AND MACHINERY

*Embeco** provides a flowable, *non-shrink* grout of high compressive strength and impact-resistance.

Recommended and used by the majority of leading equipment manufacturers for more than 30 years, *Embeco* is designed for precision grouting compressors, pumps, presses, rolling mills, crushers, balers, drop hammers, steam engines, gas engines, diesels, generators, engine test stands, bridge seats, track scales, turntables, crane rails, upsetters, shakeout machines, paper machines, pulverizers, ball mills, speed reducers, speed rings, blowers, scroll cases, leveling blocks, etc.

ADVANTAGES OF *EMBECO* IN GROUTING EQUIPMENT:

1. NON-SHRINKING: *Embeco* grout maintains alignment—provides full bearing beneath bedplate . . . overcomes both settlement and drying shrinkage of a well-designed grouting mix.

2. EASY TO PLACE: *Embeco* grout is non-shrink, even when used as a flowable, easily-placed mix. Because of Master Builders' water reducing agent and other exclusive technical components, less water is required to produce a flowable grout, resulting in higher strengths.

3. DUCTILE AND TOUGH: *Embeco* grout withstands impact, vibration and pounding action.

4. FAST HARDENING AND GREATER STRENGTH: Equipment can be put into operation sooner. *Embeco* grout hardens in 6 to 10 hours, attains 7-day strength in 24 hours and 50% greater ultimate strength. Typical data shown in tables below.

5. OIL AND WATER-RESISTANT: *Embeco* withstands disintegrating or softening action of corrosive oil and water which may be in contact with the grout.

6. ECONOMICAL: *Embeco* is the best insurance against grouting failures which cause (1) disruptive shutdowns, (2) damage to costly equipment, (3) waste of man-hours.

RECOMMENDED METHOD
(With EMBECO Pre-Mixed Grout)

ESTIMATING DATA:

Mix 1 is recommended for most grouting requirements. Mix 2 may be used where passage of grout will not be obstructed by coarse aggregate in the mix (generally 2-inch or greater clearance between bedplate and foundation).

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MIX 1:

100 lbs. *Embeco* Pre-Mixed Grout

Water— 1.5 to 1.8 gals. for plastic mix
1.8 to 2.1 gals. for flowable mix

Yield—Approximately 0.7 cu. ft. of flowable grout.

MIX 2:

100 lbs. *Embeco* Pre-Mixed Grout
50 lbs. ¼″ to ⅜″ pea gravel or stone (½ cu. ft. loose volume)
2 to 2.3 gals. water

Yield—Approximately 1.0 cu. ft. of grout.

NOTE: Water requirements listed in the above mixes are given as a guide. Job conditions, including size of the bedplate, clearances, temperature, etc., will determine the exact amount of water needed to place the grout properly.

ESTIMATING QUANTITIES PER CUBIC YARD OF FLOWABLE GROUT:

MIX 1:

3800 lbs. *Embeco* Pre-Mixed Grout
70 gals. water

MIX 2:

2600 lbs. *Embeco* Pre-Mixed Grout
1300 lbs. pea gravel
52 gals. water

ESTIMATING QUANTITIES FOR 100 SQ. FT. OF GROUT 1″ THICK:

MIX 1:

1200 lbs. *Embeco* Pre-Mixed Grout
22 gals. water

MIX 2:

800 lbs. *Embeco* Pre-Mixed Grout
400 lbs. (4 cu. ft.) pea gravel
16 gals. water

NOTE: In estimating grouting requirements, be sure to make ample allowance for material that is needed to place the grout properly, including grout for "head", additional grout in forms around bedplate, etc.

	PLAIN MIX (By weight) 1 part cement 1½ parts sand			**EMBECO PRE-MIXED GROUT (MIX 1)**	
	Compressive Strength (Lbs. per sq. in.)			Compressive Strength (Lbs. per sq. in.)	
Time	STIFF	PLASTIC	FLOW	PLASTIC	FLOW
3 hrs.	0	0	0	125	0
6 hrs.	100	0	0	975	275
24 hrs.	1275	650	450	3850	2450
3 days	4450	2550	2200	6300	5250
7 days	6500	4500	4000	7500	6125
28 days	9750	7125	6750	10000	8750

GROUTING EQUIPMENT AND MACHINERY

	PLAIN MIX (By weight) 1 part cement 1½ parts sand 1½ parts pea gravel			EMBECO PRE-MIXED GROUT (MIX 2)*	
	Compressive Strength (Lbs. per sq. in.)			Compressive Strength (Lbs. per sq. in.)	
Time	STIFF	PLASTIC	FLOW	PLASTIC	FLOW
3 hrs.	0	0	0	0	0
6 hrs.	100	0	0	350	200
24 hrs.	1120	500	340	3200	2400
3 days	3050	1650	1350	6250	5000
7 days	5250	3500	3200	6750	5500
28 days	7750	6500	6000	8950	8300

*Mix 2 is formulated at the job site by adding 50 lbs. pea gravel to 100 lbs. Embeco Pre-Mixed Grout. This mix is available as a ready-to-use product. Ask for "Special Embeco Pre-Mixed Grout with ⅜" Aggregate.

Note: Sand used in all tests was well graded. Temperature was kept constant at 70°F. Compressive strengths were made on 2" x 2" cubes with a confining cover plate, using the special testing procedure required for non-shrink grout. 6" x 12" cylinders should not be used for compressive strength tests of metallic non-shrink grouts. Before you make strength or shrinkage tests, write for details of special test method.

ALTERNATE METHOD
(With EMBECO Aggregate)

ESTIMATING DATA:

Mix A is recommended for most grouting requirements. Mix B may be used where free passage of grout will not be obstructed by coarse aggregate in the mix (generally 2-inch or greater clearance between bedplate and foundation).

MIX A (by weight):

1 part *Embeco* Aggregate (100 lbs.)
1 part portland cement (94 lbs.—1 bag)
1 part well-graded, clean concrete sand (100 lbs. of dry sand)
Water— 5.0 gals. for a plastic grout
5.3 gals. for a flowable grout

Yield—2.1 cu. ft. for flowable mix, as above.

MIX B (by weight):

1 part *Embeco* Aggregate (100 lbs.)
1 part portland cement (94 lbs.—1 bag)
1 part well-graded clean concrete sand (100 lbs. of dry sand)
1½ parts ¼" to ⅜" pea gravel or stone (150 lbs.)
Water— 5.5 gals. for a plastic grout
6.0 gals. for a flowable grout
Yield—3 cu. ft. for flowable mix, as above.

NOTE: Water requirements listed in the above mixes are given as a guide. Job conditions, including size of the bedplate, clearances, temperature, etc., will determine the exact amount of water needed to place the grout properly.

ESTIMATING QUANTITIES PER CUBIC YARD OF FLOWABLE GROUT:

MIX A:	MIX B:
12.65 bags cement	8.7 bags cement
1265 lbs. *Embeco* Aggregate	870 lbs. *Embeco* Aggregate
1265 lbs. dry sand	870 lbs. dry sand
70 gals. water	1305 lbs. pea gravel
	52 gals. water

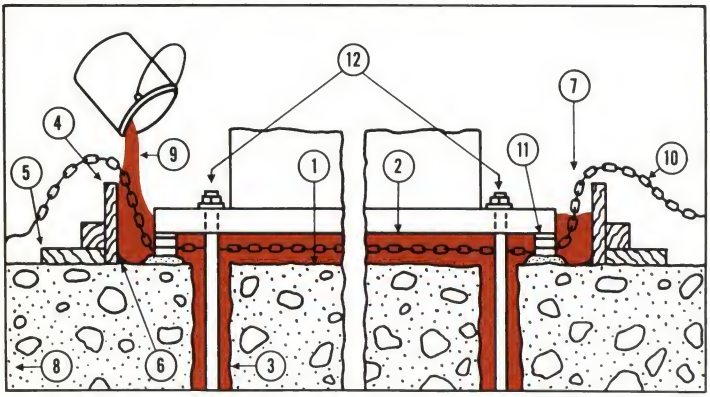
ESTIMATING QUANTITIES FOR 100 SQ. FT. OF GROUT 1" THICK:

MIX A:	MIX B:
3.9 bags cement	2.68 bags cement
390 lbs. *Embeco* Aggregate	268 lbs. *Embeco* Aggregate
390 lbs. dry sand	268 lbs. dry sand
22 gals. water	403 lbs. pea gravel
	16 gals. water

NOTE: On small jobs, a 5 gallon pail can be used for proportioning mixes. The pail holds approximately 70 lbs. dry sand, 50 lbs. portland cement, 5 gals. water, or 120 lbs. *Embeco* Aggregate.

MIXING AND PLACING OF FLOWABLE GROUT

Careful preparation and efficient follow-through are important on every grouting job. A check of the following points should be helpful. (Numbered items refer to corresponding numbers on diagram.)



PREPARATION:

1. Prior to placing the equipment, remove all defective concrete and laitance from the foundation surface by bush hammering, chipping or other means. Surface of foundation should be left reasonably level and rough, but not so rough as to interfere with proper placing of grout. Clean off surface and clean out bolt holes.

2. Remove all oil, grease, dirt and loose material from bottom of equipment base plates.

Set the equipment in position. Align and level it. Make sure that it remains in this position during subsequent operations. Check bedplate and proposed method of placement to see that adequate provisions have been made for air relief as the grout is placed.

Prior to grouting, if again necessary, clean off surface of foundation and bottom of bedplate. Use a hot, strong caustic solution to remove any oil or grease that is present. Flush off thoroughly with clean water.

3. Remove all waste materials and free water from anchor bolt holes.

To prevent water from being drawn out of the grout, the surface of the foundation should be saturated with water for at least 6 hours prior to grouting. The free water should be removed with an air hose or rags just before the grout is placed. Special care should be taken to be sure that the free water is removed from anchor bolt holes. (This problem is eliminated if anchor bolt holes are grouted as a separate operation prior to saturating the foundation.)

FORMS:

4. Forms should be built high enough to provide a "head" of grout on all sides where it is required to force grout into difficult locations.

5. Forms should be built of materials of adequate strength, securely anchored and shored to withstand the pressure of the grout under working conditions.

6. Forms should be sufficiently tight to prevent leakage, and where necessary, they should be caulked with a stiff grouting mix or other suitable material.

7. Allow adequate clearance between forms and bedplate so that grout can be properly worked into place. On sides where grout is to be worked, a minimum of 6″ clearance is desirable. On the other sides allow 2″—4″ clearance.

MIXING THE GROUT:

In advance of mixing the grout, it is desirable to make a small pat of grouting mortar with the actual materials to be used on the job to determine the approximate setting time under existing job conditions of temperature. From this, the size of the batch, speed of mixing and placing, etc., can be planned accordingly. *Do not retemper Embeco mixes.*

Continuous placement is necessary. Grouting under a single bedplate should be in a continuous operation. For large jobs, this will require careful advance planning to assure having adequate mixing and placing equipment and adequate manpower.

Mix the grout as close as possible to the equipment to be grouted. Have all necessary tools and materials close at hand, including mortar mixer or mortar box, hoes, shovels and water pails. Have a sufficient supply of all ingredients, as well as enough carrying pails or wheelbarrows, to make the grouting pour continuous once it has started.

Whether mixed by hand or in a mechanical mortar mixer, it is desirable to turn the dry mix over enough times to insure even distribution of all components. In either case, add water in the amount required to produce the desired strength and flowability. Add water slowly to assure efficient mixing. If mortar mixer is used, grout should be mixed for not less than 3 minutes after adding water.

Make first batches more flowable to provide lubricant and to prevent blocking of the grout which follows.

Do not mix more grout than can be placed in about 20 minutes. After it has been mixed, grout should not be retempered by the addition of more water.

If a ready-mix truck is used, be sure that the *Embeco* is added at the job site, not at the batching plant. Do not add and mix *Embeco* until you are completely ready to place the grout.

MIXING AND PLACING GROUT

GROUTING THE EQUIPMENT:

8. Vibration from machines operating nearby is often transmitted into the foundation of equipment being grouted. Such machines should be shut down, at least during initial setting period of new grout. Otherwise, bleeding and settlement may occur and normal set, strength and bond of the grout may be affected.

9. Place the grout quickly and continuously to avoid the undesirable effects of overworking—segregation, bleeding and breakdown of initial set. Grout should be poured from one side or end only, and across to the other side, to avoid air entrapment.

10. Be sure the grout completely fills the space to be grouted and that it is thoroughly compacted and free of air pockets. One half to one inch link chains (with wire attached to the ends to facilitate passing the chain around anchor bolts) or steel strapping pulled back and forth under the equipment during grout placement will aid greatly in working the grout into place.

FINISHING:

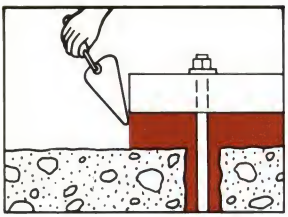
After the grout has acquired its initial set, and there is no possibility of sagging and loss of head, all unconfined edges of the grout should be handled as outlined below in "Special Handling of Unrestrained Areas."

11. If leveling devices such as shims are to be removed, they should not be disturbed for at least 48 hours after the grout has been placed. It is not necessary to remove shims or loosen leveling screws with *Embeco* grout, unless such is recommended by the equipment manufacturer.

12. After the equipment has been put into operation, it is good maintenance practice to keep nuts on anchor bolts tight. A torque wrench can be used for tightening nuts to uniform tension.

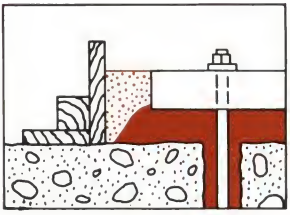
IMPORTANT:

EMBECO GROUT REQUIRES SPECIAL HANDLING OF UNRESTRAINED AREAS: *Embeco* is designed to completely counteract shrinkage and produce a compact and dense grout with maximum ductility under the bedplate area. This makes necessary special handling of those parts of the grout that are not confined. (Without special handling, unconfined edges may ravel. Raveling of the edges does not affect the grout beneath the bedplate.) Do not cut the grout shoulder too soon as loss of head and "sagging" may occur causing clearances between the grout and bedplate.

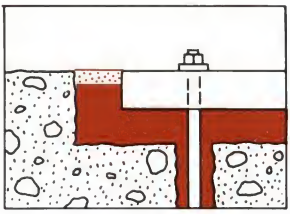


(a) Flush Cut: After grout is set hard enough so it will not sag, cut grout off vertical to the base of equipment. After the grout has dried, paint the exposed edge with a good oil base paint. This type of finish is most commonly used where side thrust is not involved.

Where grout is to be removed, painting the foundation with varnish, wax or oil before pouring prevents bond of grout and facilitates its removal after initial or final set.



(b) Shoulder Cut Back: After grout has acquired its initial set, cut back as in diagram and replace grout with a workable mortar composed of 1 part cement and 2 parts sand.



(c) Side Thrust: For equipment where side thrust is important, special care should be taken in the construction of foundations. Unconfined *Embeco* grout should be removed while still fresh (as in diagram) and replaced immediately with a workable mortar composed of 1 part cement and 2 parts sand.

COLD AND HOT WEATHER GROUTING:

Temperature affects setting time and rate at which grout gains strength. A temperature of 70° F. for the grout, equipment, and foundation is desirable for normal grouting procedures. Over 70° F. will hasten set; below 70° F. will slow set. For each 10° difference in temperature from 70° F. setting time is lengthened or shortened by about one-third. At 100° grout may flash set and at 40° F. grout will set too slowly, causing bleeding. In cold weather raise the temperature of cold equipment and cold foundations to prevent the serious effects of heat being lost from the grout. Where possible, use a heated enclosure to maintain the temperature of equipment and foundation at approximately 70° F. In exposed locations or where heated enclosures are impracticable, infra-red heaters (gas or electric) can be used to warm the equipment bedplate and foundation. Also increase the temperature of the grout mixture—first, by storing the *Embeco* Pre-Mixed Grout (and pea gravel as in the case of Mix 2) in a heated room, and secondly, by using heated mixing water as indicated in the charts below. For best results, the temperature of the grout in place should be maintained above 60° F.

MIXING AND PLACING GROUT

In hot weather, the *Embeco* Pre-Mixed Grout can be stored in a cool place, and cold or iced mixing water used to retard setting time, especially with difficult pours or extensive baseplates.

Remember, it is the temperature of equipment, bedplate and foundation and not the air temperature that determines the temperature of the grout in place.

MIX 1

Existing Temperature of Embeco Pre-Mixed Grout

	Required Temperature of Mixing Water				
90°			32°	50°	70°
80°			40°	60°	80°
70°		32°	50°	70°	90°
60°		40°	60°	80°	100°
50°	32°	50°	75°	90°	
40°	40°	60°	80°	100°	
30°	50°	70°	90°		
	50°	60°	70°	80°	90°

Desired Temperature of Mix

MIX 2

Existing Temperature of Embeco Pre-Mixed Grout and Pea Gravel

	Required Temperature of Mixing Water				
90°				45°	75°
80°			32°	60°	90°
70°		32°	50°	80°	105°
60°		40°	65°	95°	
50°	32°	55°	80°		
40°	40°	75°	95°		
30°	60°	85°			
	50°	60°	70°	80°	90°

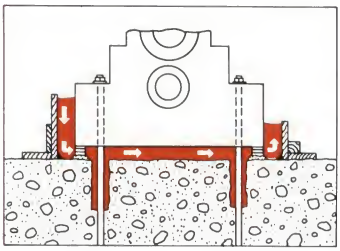
Desired Temperature of Mix

(Temperatures are shown in Fahrenheit)

SOME COMMON METHODS OF GROUTING

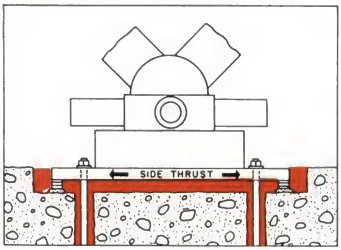
It is difficult to picture in detail all of the many different types of equipment and requirements for grouting. However, a majority of the problems of machinery grouting are represented in these drawings—or in a combination of two or more.

GRAVITY GROUTING PLUS RODDING AND WORKING: This is the most common method of grouting. Much depends upon the complete flowability of the grout,



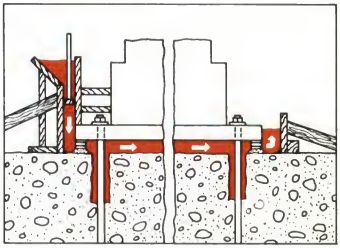
plus adequate rodding and working into place in the shortest period of time.

FOUNDATION DESIGN FOR ENGINES WITH SIDE THRUST: A recessed foundation for engines with unusual side thrust provides stability. Otherwise it will be



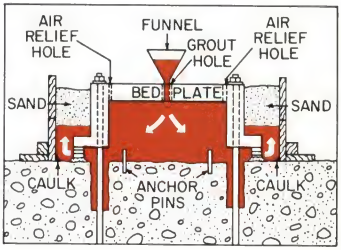
necessary to build reinforced concrete shoulders with adequate shear strength.

WELL AND PLUNGER PRESSURE GROUTING FOR SOLID WIDE BEDPLATES: This method is effectively employed where bedplates are over 8 to 10 feet wide. Successful grouting depends upon flowing



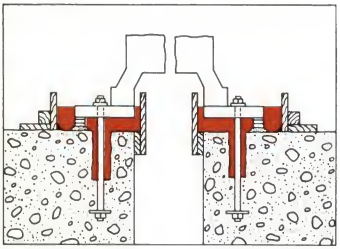
the grout from one side to the other. Strong, well anchored forms, and uninterrupted flow of grout are absolutely essential.

GROUTING HOLLOW ENGINE BASE PLATES THROUGH CENTER HOLES: Conservation of weight and materials has brought about the general use of hollow bedplates. Successful grouting in these cases is doubly important. Grout-



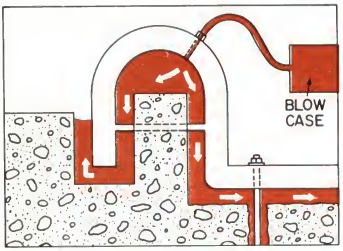
ing is done from central holes. Once the grout starts flowing up and around engine base plates, damp sand may be placed on top of grout to equalize pressure, conserve grout, and hasten finishing operation after grout has acquired final set.

SPLIT FOUNDATION WITH CLOSE CLEARANCES: Adequate clearance between forms and bedplates on the inside is essential to effective

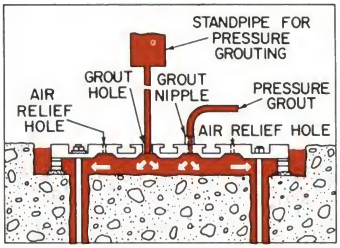


compacting of grout. Unconfined grout should be removed after final set, and exposed surface painted with an oil base paint.

PRESSURE GROUTING DIFFICULT RECESSES — SCROLL CASES, SPEED RINGS, ETC.: Blow casings, hand pressure pumps, pressure pumps, standpipe and funnels have been found to be effective grouting aids under many conditions of specialized equipment. Extreme caution must be exercised to keep operation continuous after grouting has started, to avoid excessive pressures due to stiffening of grout. In hot weather, the use of ice water to mix grout will extend greatly the period of flowability.

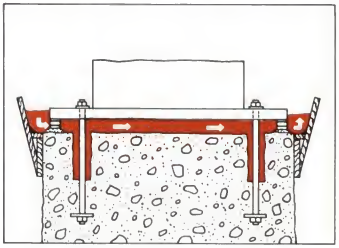


LEVELING BLOCK OR TEST STAND: Engine test blocks with many cleavage planes in the base plate are most efficiently grouted by the



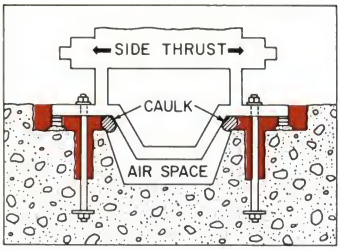
use of blow casings or standpipe and funnel. Continuous flow of grout and air relief holes are imperative.

SPECIAL POCKET FORMS FOR FOUNDATIONS WITH CLOSE CLEARANCE: Where foundations do not allow enough space for working between bedplate and



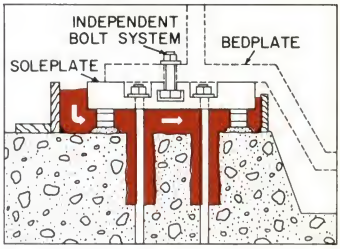
forms, special pockets must be securely constructed to provide working space.

BASE PLATE AND DEEP CRANKCASE GROUTING: Because of high operating temperatures, the crankcase should be free to expand. Caulk the space between the



foundation and upper portion of the crankcase to prevent grout from running beneath the case. For horizontal stability, use the reinforced foundation shoulder described under "FOUNDATION DESIGN FOR ENGINES WITH SIDE THRUST."

ENGINES REQUIRING INDEPENDENT SOLEPLATES: Soleplates are generally used when equipment will undergo considerable temperature change requiring freedom of movement (thermal expansion) within a limited range. An independent system of bolting allows for movement between the soleplate and bedplate and not between grout and soleplate. The nuts on the bolts of the independent bolting system are not drawn down tight. The sketch illustrates grouting of soleplate and foundation bolts before equipment is placed on soleplate. Soleplates are also used where precise alignment is required of several pieces of equipment; in this case, the nuts are turned down tight.



NOTE: Bedplates that have an irregular or concaved underside that can trap air when grout is placed require air relief holes to permit escape of air and rise of grout.

IMPORTANT USES OF EMBECO

SETTING ANCHOR BOLTS

ADVANTAGES OF *EMBECO* PRE-MIXED GROUT:

Use of *Embeco* Pre-Mixed Grout reduces costs, provides a non-shrink grout and eliminates the physical hazards of using molten lead and sulfur grouts.

PROCEDURE:

1. Prepare bolt hole (chip and clean).
2. Saturate with water.
3. Add water and mix *Embeco* Pre-Mixed Grout to produce plastic or flowable consistency as desired.
4. Place the grout.
5. Cure with *MasterKure.*

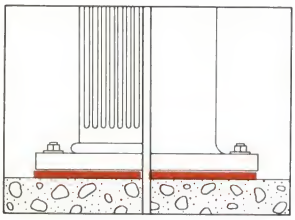
ESTIMATING DATA:

Yield—Approximately 0.7 cu. ft. of non-shrink grout with 100 lb. bag of *Embeco* Pre-Mixed Grout.

SETTING BUILDING COLUMNS

ADVANTAGES OF *EMBECO* PRE-MIXED GROUT:

Embeco Pre-Mixed Grout provides a non-shrink grout with full bedplate contact and eliminates bush hammering, honing and grinding, and costly shimming with lead.



PROCEDURE:

1. Prepare surface.
2. Saturate with water.
3. Add water and mix *Embeco* Pre-Mixed Grout to produce plastic or flowable consistency. Do not retemper; mix only as much grout as can be used within 20 minutes.
4. Place the grout.
5. After grout has taken its initial set, cut off unconfined edges of grout and replace with mortar composed of 1 part cement and 2 parts sand.
6. Cure with *MasterKure.*

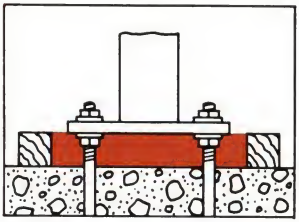
ESTIMATING DATA:

Yield—Approximately 0.7 cu. ft. of non-shrink grout with 100 lb. bag of *Embeco* Pre-Mixed Grout.

SETTING STEEL COLUMNS

ADVANTAGES OF *EMBECO* PRE-MIXED GROUT:

Embeco Pre-Mixed Grout provides a non-shrink grout with full bedplate contact and eliminates bush hammering, honing and grinding, and costly shimming with lead.



PROCEDURE:

1. Place washer on lower nut and adjust for elevation.
2. Set column in place.
3. Place washer on plate and tighten nut.
4. Adjust for elevation and plumb column.
5. Add water and mix *Embeco* Pre-Mixed Grout to produce plastic or flowable consistency. Do not retemper; mix only as much grout as can be used within 20 minutes.
6. Grout between base plate and foundation before loading structural steel.
7. After grout has taken its initial set, cut off unconfined edges and cover the edges with mortar composed of 1 part cement and 2 parts sand.
8. Cure with *MasterKure.*

ESTIMATING DATA:

Yield—Approximately 0.7 cu. ft. of non-shrink grout with 100 lb. bag of *Embeco* Pre-Mixed Grout.

PRESSURE GROUTING

ADVANTAGES OF *EMBECO* NO. 5:

The finer gradation of *Embeco* No. 5 provides a non-shrink material for clearances ¼″ or less.

WHERE USED:

For grouting and stabilizing stone masonry piers and cracks in mass concrete structures such as piers, dams, and foundations.

PROCEDURE:

The operational procedure for a pressure grouting job is completely dependent on the nature and layout of the job. For example, in the grouting of cracks in mass concrete it may be necessary to set in pipe nipples at intervals so as to inject the mortar into the crack. On stone masonry piers, exposed mortar may have to be repointed or caulked prior to pressure grouting, so as to confine the grouting mortar.

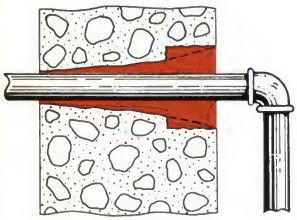
Because of the varied nature of these jobs, it is recommended that information concerning the job be provided to Master Builders Engineering Department for a specific recommendation on our products.

IMPORTANT *EMBECO* USES

GROUTING AROUND PIPES THROUGH WALLS

ADVANTAGES OF *EMBECO* PRE-MIXED MORTAR:

Embeco Pre-Mixed Mortar prevents water seepage, and bonds tightly to the adjacent surfaces.



PROCEDURE:

1. Clean and prepare hole around pipe.
2. Saturate with water.
3. Remove excess water and scrub in bond coat composed of a slurry of *Embeco* Pre-Mixed Mortar.
4. Add 1.3 to 1.5 gals. of water per 100 lb. bag of *Embeco* Pre-Mixed Mortar to produce a plastic mortar.
5. Place the mortar.
6. Cure with *MasterKure.*

ESTIMATING DATA:

Yield—Approximately 0.75 cu. ft. of non-shrink mortar with 100 lb. bag of *Embeco* Pre-Mixed Mortar.

GROUTING STEEL FLOOR GRIDS

ADVANTAGES OF *EMBECO* AGGREGATE:

Ductility of *Embeco* Aggregate mortar minimizes pitting of the cores and premature wear of steel grids. Non-shrink cores do not pull out. Due to low absorption, spillage can be cleaned from surface.

PROCEDURE:

1. Prepare surface.
2. Saturate with water and scrub in slush bond coat.
3. Immediately place grid. Mix and place *Embeco* Aggregate mortar before bond coat sets.
4. Cure with *MasterKure.*

MIX DESIGN BY WEIGHT:

¼ part *Embeco* Aggregate (25 lbs.);
1 part portland cement (94 lbs.—1 bag);
2 parts clean silica sand (200 lbs.);
with sufficient water to make a plastic mortar.

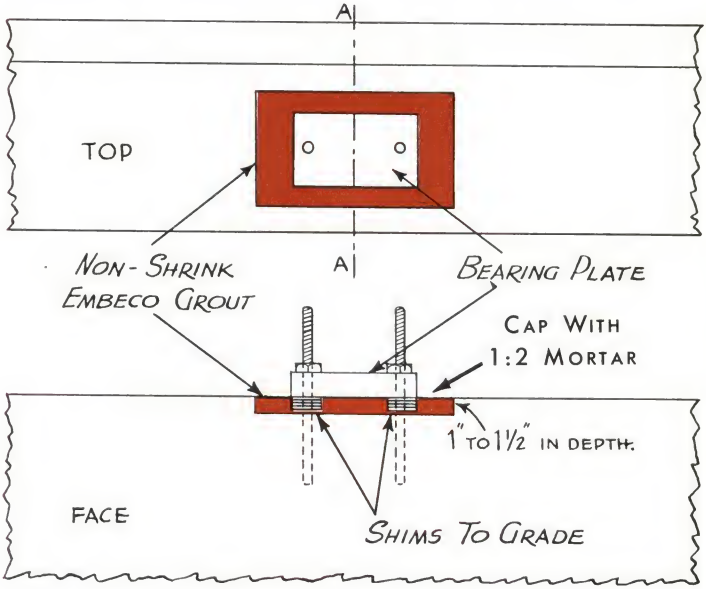
ESTIMATING DATA:

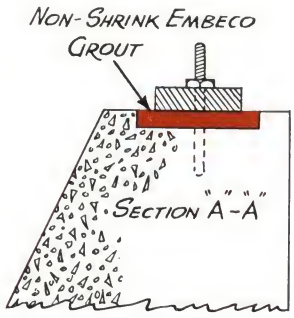
Yield—2.5 cu. ft. non-shrink mortar produced with the above mix.

SETTING BEARING PLATES AND BRIDGE SEATS ON HIGHWAY BRIDGES

ADVANTAGES OF *EMBECO* PRE-MIXED GROUT:

Embeco Pre-Mixed Grout provides a non-shrink grout while eliminating bush hammering, honing and grinding, and costly shimming with lead.





PROCEDURE:

1. Prepare surface.
2. Saturate with water.
3. Add water and mix *Embeco* Pre-Mixed Grout to produce plastic or flowable consistency. Do not retemper; mix only as much grout as can be used within 20 minutes.
4. Place the grout.
5. After grout has taken its initial set, cut off unconfined edges of grout and cap with mortar composed of 1 part cement and 2 parts sand.
6. Cure with *MasterKure.*

ESTIMATING DATA:

Yield—Approximately 0.7 cu. ft. of non-shrink grout with 100 lb. bag of *Embeco* Pre-Mixed Grout.

GUNNED MORTAR

ADVANTAGES OF *EMBECO* AGGREGATE:

Embeco Aggregate counteracts drying shrinkage which normally occurs in gunned mortar.

Application of gunned mortar.

PROCEDURE:

Embeco Aggregate is mixed with other materials (dry) that are introduced into gunned mortar machine. Apply mortar to desired thickness; trowel surface and cure.

MIX DESIGN BY WEIGHT:

15% *Embeco* Aggregate by weight of portland cement (15 lbs.)
1 part portland cement (94 lbs.—1 bag)
3 parts concrete sand (300 lbs.)

Where a non-staining mortar is required, use a cement-sand mix for the last application.

ESTIMATING DATA:

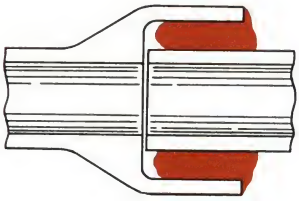
For 100 sq. ft. 1″ thick, use:

40 lbs. *Embeco* Aggregate
270 lbs. (2.9 bags) portland cement
880 lbs. concrete sand

CAULKING PIPE JOINTS

ADVANTAGES OF *EMBECO* PRE-MIXED MORTAR:

Embeco Pre-Mixed Mortar eliminates shrinkage, and increases water-resistance of the joint. It minimizes water loss, infiltration, and costly damage from tree roots attracted to leaky pipe joints. It provides a water-resistant plaster coat over the joint.



PROCEDURE:

Add 1.3 to 1.5 gals. of water per 100 lb. bag of *Embeco* Pre-Mixed Mortar to produce a stiff or plastic mortar.

ESTIMATING DATA:

Yield—Approximately 0.75 cu. ft. of non-shrink mortar produced with the above mix.

FOR TONGUE AND GROOVE PIPE

Inside Diameter of Pipe	Lbs. of *Embeco* Pre-Mixed Mortar Per Joint
24″	4.1
27″	5.3
30″	5.9
36″	8.0
48″	13.6
60″	20.4
72″	28.5
84″	38.0
108″	55.0

FOR BELL AND SPIGOT PIPE

Inside Diameter of Pipe	Lbs. of *Embeco* Pre-Mixed Mortar Per Joint
4″	0.7
6″	1.7
8″	2.7
10″	3.3
12″	4.2
15″	4.8
18″	7.3
24″	11.9

IMPORTANT *EMBECO* USES

PATCHING HORIZONTAL CONCRETE SURFACES

ADVANTAGES OF *EMBECO* PRE-MIXED MORTAR:

Embeco Pre-Mixed Mortar is free of horizontal shrinkage. It aids in maintaining bond between the new and old concrete. The dense mortar has low absorption and permeability.

WHERE USED:

For making non-shrink repairs to small cracks, holes, ruts, and worn areas of concrete floors, steps, walks, roadways, etc.—indoors and outdoors, where a rich cement-sand mortar would normally be used.

PROCEDURE:

1. Chip or cut out concrete to a depth of at least one inch if hole itself is not deeper. All unsound concrete should be removed. Cracks should be chipped out to a width of at least one inch as well as a depth of one inch. Edges of area to be repaired should be square cut to a vertical or preferably an inward direction. Hammer and chisel, jack hammer, and concrete saw may prove useful, depending upon the size and shape of area to be repaired.

2. Wire-brush area to be repaired, to remove all loose particles. If oil and grease remain, remove with caustic cleaner. Thoroughly flush area with clean water to remove all traces of caustic cleaner. Area to be repaired should be rough, clean and sound, to insure good bonding.

3. In order to prevent the old concrete from absorbing water too readily from the new mortar, thoroughly saturate the area to be repaired and adjacent areas with clean water. Flood the area and let the water soak into the concrete for at least 20 minutes—up to six hours if possible (depending upon the absorbency of the concrete). Then remove free water, leaving area to be repaired wet.

4. Dust on dry *Embeco* Pre-Mixed Mortar and scrub in as bond coat. Use stiff brush to scrub bond coat thoroughly into surface and around edges, including adjacent areas. Do not let bond coat dry out before covering with mortar. Bond coat should be wet, but there should be no free water standing when mortar is placed.

5. Prepare plastic mix, using about 1.5 gals. of clean water per 100 lb. bag of *Embeco* Pre-Mixed Mortar. *Embeco* Pre-Mixed Mortar can be mixed by hand or in a mortar mixer. In either case, mix thoroughly to uniform consistency. Mix only as much *Embeco* Pre-Mixed Mortar as can be used in about 20 minutes under normal temperature conditions (70°F). Once mortar has taken its initial set, do not retemper by adding more water.

6. Place *Embeco* Pre-Mixed Mortar, making sure mortar is well compacted in hole. Screed and float even with existing floor level.

For holes over one foot in diameter, 50 lbs. of ¼″ to ⅜″ pea gravel or stone per 100 lb. bag of *Embeco* Pre-Mixed Mortar should be added. For very large areas, resurfacing should be considered using a topping mix.

7. If smooth surface is desired, steel trowel surface after patch has stiffened. Protect area from traffic. Proper curing is essential to obtain maximum strength and durability. After finish cannot be dented by thumbnail pressure, keep surface and adjacent areas continually wet for at least three days or until the repaired area must be put back into use. Area can be kept wet by "ponding" (forming a dike of clay around the area, 6 to 10 inches from the new mortar, and flooding the area with water) or by keeping continually wet sand, wet dirt, or wet burlap over the repaired area.

NOTE: To achieve the appearance of plain concrete or mortar, apply a dust coat of non-colored *Colorcron,* or a 1:2 cement-sand mortar approximately ⅛″ thick over the surface of the plastic mortar; float and finish.

For holes over one foot in diameter, 50 lbs. of ¼″ to ⅜″ pea gravel or stone per 100 lb. bag of *Embeco* Pre-Mixed Mortar should be added. For very large areas, resurfacing should be considered using a topping mix.

ESTIMATING DATA:

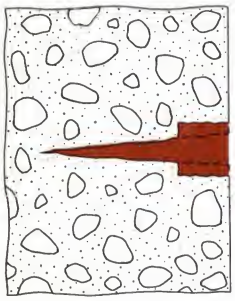
Yield—Approximately 0.75 cu. ft. of non-shrink mortar with 100 lb. bag of *Embeco* Pre-Mixed Mortar. With the addition of 50 lbs. of pea gravel per 100 lb. bag of *Embeco* Pre-Mixed Mortar, the yield will be approximately 1 cu. ft.

IMPORTANT *EMBECO* USES

PATCHING VERTICAL CONCRETE SURFACES

ADVANTAGES OF *EMBECO* PRE-MIXED MORTAR:

Because *Embeco* Pre-Mixed Mortar is non-shrink, it prevents leakage. Bond strength of *Embeco* mortar to concrete is equal to or greater than that of concrete itself.



PROCEDURE:

1. Cut out unsound concrete to at least a 1-inch depth.
2. Square cut shoulder. Cracks should be chipped to at least one inch in width.
3. Saturate with water.
4. Scrub in a slush bond coat consisting of a slurry of *Embeco* Pre-Mixed Mortar.
5. Add 1.3 to 1.5 gals. of water per 100 lb. bag of *Embeco* Pre-Mixed Mortar to produce a stiff or plastic mortar.
6. Place the patching mortar.
7. Wet cure.

NOTE: To achieve the appearance of plain concrete or mortar, apply a dust coat of non-colored *Colorcron,* or a 1:2 cement-sand mortar approximately ⅛″ thick over the surface of the plastic mortar; float and finish. For holes over 4″ wide and more than 1″ deep, 50 lbs. of ¼″ to ⅜″ pea gravel or stone per 100 lb. bag of *Embeco* Pre-Mixed Mortar should be added. For larger patches or repairs, use a mix of leaner proportions with larger aggregate, adding 15% *Embeco* Aggregate by weight of cement. See page 70A.

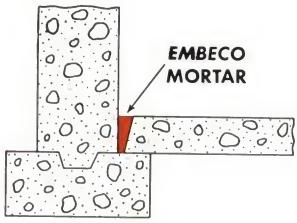
ESTIMATING DATA:

Yield—Approximately 0.75 cu. ft. of non-shrink mortar with 100 lb. bag of *Embeco* Pre-Mixed Mortar. With the addition of 50 lbs. of pea gravel per 100 lb. bag of *Embeco* Pre-Mixed Mortar, the yield will be approximately 1 cu. ft.

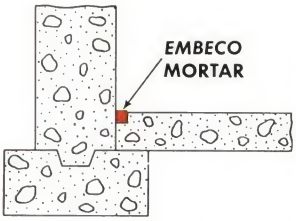
CAULKING SEAM BETWEEN FLOOR SLAB AND WALL BELOW GRADE

ADVANTAGES OF *EMBECO* PRE-MIXED MORTAR:

Embeco Pre-Mixed Mortar prevents leakage of ground water at this vulnerable point; compensates for shrinkage of floor slab. For the seams above grade, ordinary expansion joint material is used.



New Construction



Old Construction

PROCEDURE:

NEW CONSTRUCTION:

1. Place piece of beveled siding on footing along the wall prior to pouring the floor.

2. Remove beveled siding when floor has hardened.

3. Scrub into the seam a slush bond coat consisting of a slurry of *Embeco* Pre-Mixed Mortar.

4. Add 1.3 to 1.5 gals. of water per 100 lb. bag of *Embeco* Pre-Mixed Mortar to produce a stiff or plastic mortar.

5. Caulk the seam.

6. Wet cure.

OLD CONSTRUCTION:

Cut out a seam along the wall line to a depth of 1″. Follow the same procedure as outlined in Steps 3, 4, 5 and 6 above.

ESTIMATING DATA:

Yield—Approximately 0.75 cu. ft. of non-shrink mortar with 100 lb. bag of *Embeco* Pre-Mixed Mortar.

IMPORTANT *EMBECO* USES

FOUNDATION TREATMENTS

PLASTER COAT METHOD

ADVANTAGES OF *EMBECO* AGGREGATE:

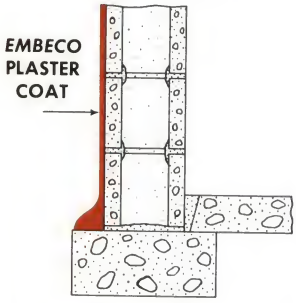
Provides an efficient and lasting protection against water penetration; lasts the life of the structure. Particularly recommended for structures where there are known adverse water conditions.

Assures dense, tight foundation walls, except for cracks resulting from settlement or structural failure. Improves with age—nothing to dry out as with tar, hot or cold asphalt, and plastic coatings.

More effective than plain plaster coat, because it prevents the occurrence of shrinkage cracks; also because the densifying action of the metallic aggregate greatly lowers the porosity of the mortar.

WHERE USED:

For plaster coat treatment to either exterior or interior foundation walls constructed of concrete or concrete block. Particularly recommended for structures where there are known adverse water conditions—structures built near rivers or where underground water is encountered in excavating. Interior application over glazed block is not recommended. (Do not use *Embeco* Pre-Mixed Mortar for plaster coating.)



Plaster Coat Method

PROCEDURE:

1. Clean the surface to be treated; scrub off mud, dirt and loose mortar drippings.

(If the surface is dense and smooth, such as new concrete work, it must be chipped and roughened by bush hammering, acid-etching or other means, to provide mechanical bond for the plaster coat. Plaster coats will not adhere to smooth or painted surfaces.)

2. Saturate surface with water.

3. Prepare a BOND COAT of:
1 part *Embeco* Aggregate (100 lbs.);
1 part portland cement (94 lbs.—1 bag);
with sufficient water to produce a grout of brushable consistency.

4. Scrub bond coat into the prepared surface with stiff bristle brush.

5. Prepare a PLASTER COAT of:
¼ part *Embeco* Aggregate (25 lbs.);
1 part portland cement (94 lbs.—1 bag);
3 parts concrete sand (300 lbs.);
mixed with the minimum water required to obtain trowelable consistency.

6. Before the bond coat has dried, trowel on the *Embeco* Aggregate plaster coat, ¼" thick. Trowel on second coat for greater than ¼" thickness. Compact and trowel the surface to a smooth finish.
7. Cure—keep the plaster coat damp for at least 24 hours and protect from direct rays of the sun.

ESTIMATING DATA:

For 100 sq. ft. Bond Coat:	For 100 sq. ft. Plaster Coat ½" thick:
16 lbs. *Embeco* Aggregate	35 lbs. *Embeco* Aggregate
15 lbs. portland cement	130 lbs. (1.4 bags) portland cement
	390 lbs. sand

STANDARD SPECIFICATION:

All exterior surfaces (or interior surfaces as conditions dictate) of foundation walls and footings shall be plastered with not less than ½" of *Embeco* Aggregate mortar in strict accordance with the directions of the manufacturer, The Master Builders Company.

NOTE: The plaster coat mix described above may also be used to advantage in the following places:

1. Between footing and foundation wall.
2. Cove between footing and foundation wall—to assure free water run-off.
3. Between top of foundation and plate.
4. For caulking seam between floor slab and wall below grade.

BRUSH COAT METHOD

ADVANTAGES OF *EMBECO*:

Provides an effective and lasting means for checking the passage of water through foundation walls, even when the water is under pressure. Successive brush coats are easily applied to wet surface to form a tightly bonded metallic sheath. Ammonia-free—no asphyxiating odors—makes for higher quality workmanship.

WHERE USED:

For exterior or interior foundation walls constructed of concrete block or roughened concrete. Application over smooth formed concrete or glazed block is not recommended.

For reservoirs, swimming pools, elevator pits, retaining walls, sewers, tunnels, storage tanks.

RECOMMENDED *EMBECO* METHOD:

For fine-pore roughened surfaces (concrete, concrete block, soft brick, hollow tile or stone), use *Embeco* No. 5.

For open-pore surfaces (cinder, haydite and other lightweight block) use *Embeco* Aggregate.

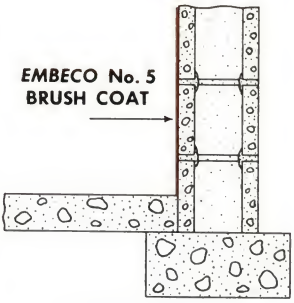
IMPORTANT *EMBECO* USES

PROCEDURE:

1. The surface must be thoroughly roughened, cleaned and made free of all debris, oil, grease, mud, dirt and such material or texture that would cause poor bond between the wall and the brush coat treatment.

2. Saturate surface with water.

3. With stiff bristle brush, scrub in a wet mixture of 1 part *Embeco* (use appropriate type indicated above) and water. Work *Embeco* into pores—do not build up a veneer.



Brush Coat Method

4. When the *Embeco* will not be disturbed by a light spray of water, dampen surface every 3 hours for 24 hours.

5. When *Embeco* has oxidized to a reddish-brown color, saturate surface and brush on a mixture of:
1 part *Embeco* (100 lbs.);
3 parts portland cement (282 lbs.—3 bags);
1 part fine sand (100 lbs.);
with sufficient water to make a creamy consistency.

6. Twenty-four hours later, repeat operation 3 above, followed by operations 4 and 5.

7. Cure—keep brush coat damp for at least 24 hours and protect from direct rays of the sun.

The four coats described here are usually satisfactory under average water conditions. Under adverse conditions, apply additional coats; under favorable conditions, only 2 coats may be needed.

STANDARD SPECIFICATION:

The Metallic Brush Coat Treatment to reduce permeability of concrete, concrete block, soft brick, hollow tile, or stone shall be *Embeco* No. 5, applied in exact accordance with the directions of the manufacturer, The Master Builders Company.

The Metallic Brush Coat Treatment to reduce permeability of haydite or cinder block shall be *Embeco* Aggregate, applied in exact accordance with the directions of the manufacturer, The Master Builders Company.

NOTE: Metallic waterproofing for GSA Specifications is available on special order. Consult your Master Builders fieldman.

ESTIMATING DATA:

Brush Coat Foundation Treatment	Mix Design (by weight)			Mix Consistency	For 100 square feet of prepared surface		
	Embeco	Normal Cement	Fine Sand		*Embeco*	Cement	Sand
1st & 3rd coats	1	—	—	Wetted	10 lbs.	—	—
2nd & 4th coats	1	3	1	Creamy	5 lbs.	15 lbs.	5 lbs.

SETTING AND RESETTING FLOOR BRICK, DECK TILE, QUARRY TILE, AND INDUSTRIAL TILE UNITS

ADVANTAGES OF *EMBECO*:

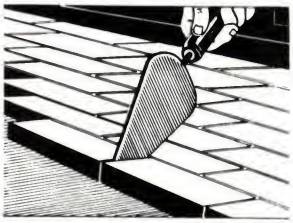
1. *Embeco* helps make narrow, tight joints. A flowable *Embeco* mortar does not shrink on hardening.

2. *Embeco* produces corrosion-resistant joints. Because an *Embeco* mortar is non-shrink and has high density, corrosive materials are kept on the surface where they can easily be flushed off.

3. *Embeco* produces wear-resistant joints. The high strength and ductility of *Embeco* mortar prevents chipping of the corners of the brick.

4. *Embeco* minimizes maintenance. Although *Embeco* mortar resists the corrosive action of many substances, it is affected by those which attack cement and iron. With *Embeco* mortar, this corrosion takes place only on the surface of the mortar, and not through the depth of the joint.

5. *Embeco* protects the bedding and promotes sanitation.



EMBECO aids in producing narrow, tight, non-shrink joints.

WHERE USED:

For setting floor brick, quarry tile, vitrified brick, split brick and exposed floor tile units—where high corrosion-resistance, low permeability and low absorption are required.

For bakeries, bottling plants, breweries, canneries, chemical plants, confectioneries, dairies, distilleries, food processing plants, hospitals, laboratories, meat packing plants, metal treating plants, restaurants and tanneries.

RECOMMENDED *EMBECO* METHOD:

For filling joints more than ¼″ in width, use *Embeco* Aggregate.
For filling joints ¼″ in width or less, use *Embeco* No. 5.

MIX DESIGNS AND ESTIMATING DATA:

For More Than ¼″ Joints

25 lbs. *Embeco* Aggregate
1 bag portland cement
2 cu. ft. sharp, clean sand

Yield—Above mix produces sufficient mortar to fill the joints in approximately 65 sq. ft. of floor, using ½″ joints and 4″ x 8″ x 1⅜″ floor brick.

For Joints of ¼″ and Less

25 lbs. *Embeco* No. 5
1 bag portland cement

Yield—Above mix produces sufficient mortar to fill the joints in approximately 50 sq. ft. of floor, using ¼″ joints and 4″ x 8″ x 1⅜″ floor brick.

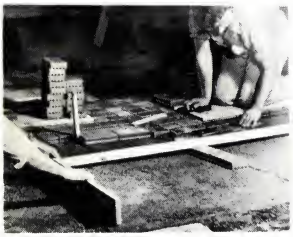
IMPORTANT *EMBECO* USES

NOTE: These coverage figures will vary according to the depth to which the cleat is embedded in the bed, the amount of water absorbed from the joint mix by the bed and the amount of dryer mix used. For tile other than 4″ x 8″ in area, adjust accordingly, using 5 as the number of linear feet of joint per sq. ft. of floor for the 4″ x 8″ unit. For units of different thickness and joints of different width, adjust estimating data accordingly.

PROCEDURE:

Tile setting practice varies considerably in different areas, in different industries and from mechanic to mechanic, so that no attempt is made here to present a standard installation procedure. However, *Embeco* conveniently fits into the various procedures and affords a measurable improvement by producing a non-shrink mortar.

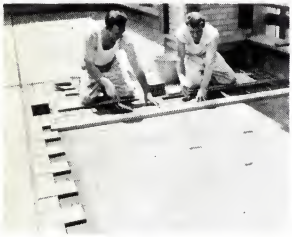
The following suggestions may prove helpful:



Workmen leveling bedding mortar to correct level.

1. THE BASE SLAB— Where brick or tile units are to be installed over an old floor, it is important that all grease or oil be removed from the base slab. With both old and new floors, satisfactory results can be obtained only where the base slab has been designed to meet structural requirements.

2. THE BEDDING MIX — The usual proportion of the bedding mix is one part of portland cement to three parts of sand, adding only sufficient water to produce a dry, crumbly consistency, but still to permit compaction. Only as much mortar should be prepared and placed as the tile setter can cover in one hour. It is general practice to use not less than a one-inch bed of mortar, except at drains, where the thickness may be reduced to one-half inch.



Lining up tile with straight edge. 3/16″ joints on this job.

3. THE BOND COAT— To strengthen the bond of brick to bedding, a neat portland cement bond coat is recommended. Use 0.3 lb. of portland cement per square foot, dusted over the surface of the bedding mix. Prepare an area no larger than can be covered with brick in 30 minutes.

4. SETTING THE BRICK— Bricks are set on the bedding to the width of joint specified. Bricks are tamped into the mortar to the proper elevation, making sure that they are level and true.

NOTE: In subsequent operations, use *Embeco* Aggregate for joints of over ¼″ in width and *Embeco* No. 5 for joints ¼″ and less in width.

5. FILLING THE JOINT—Two types of mixes are commonly used for filling mortar joints:

(a) "Wet Mix", or grout—used by many tile setters to provide rapid placement and assurance that the joints and cleats are completely filled. This is prepared by adding sufficient water to the appropriate mix to produce a thin, creamy consistency.

The grout is poured over the surface of the tile and squeegeed into the joints, working back and forth across the floor to eliminate air pockets and to completely fill the joints. Much of the excess water seeps into the bedding mix, leaving a relatively dry mortar for the joint.

(b) "Dry Mix", or mortar—produced by adding sufficient water to produce a pancake batter consistency.

The edges of the tile can be buttered with the *Embeco* non-shrink mortar, and the tile set in place, eliminating Operation 4 above. Or the mortar can be shoved into the joints of the tile already in place, using a pointing trowel to insure compaction.

Pounding brick into bed. Trowel blade used to check uniformity of joint width.

6. DENSIFYING THE JOINT — After filling either narrow or wide joints, apply a densifying and drying mix, produced by mixing dry one bag of portland cement, 1 cubic foot of clean, sharp, dry sand, and 25 lbs. of *Embeco,* of the same type as used for the joint mix. This is brushed over the surface of the floor, and is used only until it becomes damp, when it is discarded and a fresh lot is used.

7. CLEANING OR BAGGING—The floor is then cleaned by rubbing with a burlap pad. This "bagging" operation rubs the remaining portion of the Dryer Mix into the joints, and because of the abrasive action of the sand, removes all mortar adhering to the brick.

IMPORTANT *EMBECO* USES

REPAIRING JOINTS OF BRICK AND TILE FLOORS

ADVANTAGES OF *EMBECO* PRE-MIXED MORTAR:

Because it does not shrink, *Embeco* Pre-Mixed Mortar bonds tightly to the old mortar and to the brick. It prevents corrosive substances from penetrating below the surface of the floor.

PROCEDURE:

The following procedure should be used only where there is no evidence of loose brick or corrosion of the bedding. Repairing the joints will not correct a corroded condition already existing in the bed.

1. Thoroughly clean the floor, using normal cleaning procedure, removing soft or corroded joint mortar. (Chipping out unsound mortar with hammer and chisel or other suitable method may be necessary.)

2. Some tile setting contractors then wet the entire floor with a 10% solution of muriatic acid and allow it to soak for about ½ hour. If this procedure is followed, customary safety precautions in connection with the use of acid should be observed.

3. Thoroughly flush the floor with clean water, so that joints are absolutely clean. Remove all excess water.

4. For joints ¼" in width or wider, add sufficient water to *Embeco* Pre-Mixed Mortar to obtain a flowable mix that can be slushed into the joints. (For joints less than ¼" wide, substitute a mixture of 50 lbs. of *Embeco* No. 5 and 1 bag of standard portland cement, with sufficient water to make a flowable mix.)

5. Broom or squeegee the mix back and forth across the floor, filling all voids and cracks in joints. Discard excess mortar.

6. Dust dry *Embeco* Pre-Mixed Mortar over the surface of the area. Broom or squeegee the dry mix back and forth to absorb excess mortar and densify the joint mortar. Use each batch of dry mix until it becomes damp, then discard it and use a fresh dry batch.

(For repair of joints less than ¼" wide where *Embeco* No. 5 has been used, employ a dry mix of 50 lbs. of *Embeco* No. 5 and 1 bag of standard portland cement.)

7. Remove any excess mortar by rubbing carefully with a burlap pad.

8. After mortar has hardened, make a final cleaning.

ESTIMATING DATA:

Yield—Approximately 0.75 cu. ft. of non-shrink mortar with 100 lb. bag of *Embeco* Pre-Mixed Mortar.

METALLIC WATERPROOFING

Brush Coat Foundation Treatment

DESCRIPTION:

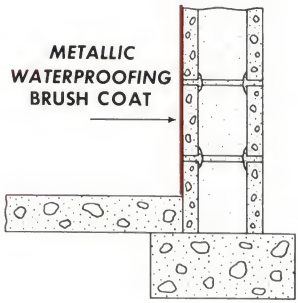
Metallic Waterproofing is a specially-prepared metallic aggregate, 85 to 100% passing a 60 mesh screen, combined with an ammonia-type oxidizing catalyst. When scrubbed into pores of masonry surfaces, the iron particles in *Metallic Waterproofing* expand to seal off moisture penetration.

WHERE USED:

For exterior or interior foundation walls constructed of concrete or concrete block. Application over glazed block is not recommended. For reservoirs, swimming pools, retaining walls and for sealing the surface of weathered concrete structures.

For open pore surfaces (cinder, haydite and other lightweight block) use *Embeco** Aggregate.

ADVANTAGES OF *METALLIC WATERPROOFING*:



1. Provides effective and lasting protection against infiltration of water.
2. Easy to apply—no special tools or skill required.
3. Can be applied on wet surfaces, exterior or interior, though exterior application is preferable.

NOTE: For work in confined or poorly ventilated areas (tunnels, pits, etc.) *Embeco* No. 5 with an ammonia-free oxidizing catalyst is recommended.

ESTIMATING DATA:

Brush Coat Foundation Treatment	Mix Design (by weight)			Mix Consistency	For 100 square feet of prepared surface		
	Metallic Waterproofing	Normal Cement	Fine Sand		*Metallic Waterproofing*	Cement	Sand
1st & 3rd coats	1	—	—	Wetted	10 lbs.	—	—
2nd & 4th coats	1	3	1	Creamy	5 lbs.	15 lbs.	5 lbs.

PACKAGING:

100 lb. bags and 100, 50 and 20 lb. pails.

FREIGHT CLASSIFICATION:

Cement Compound, Building or Floor, Dry.

**Registered trademark.*

METALLIC WATERPROOFING

STANDARD SPECIFICATION:

The Metallic Brush Coat Treatment to reduce permeability of concrete, concrete block, soft brick, hollow tile or stone shall be *Metallic Waterproofing* applied in strict accordance with the directions of the manufacturer, The Master Builders Company.

The Metallic Brush Coat Treatment to reduce permeability of haydite or cinder block shall be *Embeco* Aggregate, applied in strict accordance with the directions of the manufacturer, The Master Builders Company.

RELATED PRODUCTS:

***EMBECO* No. 5**—Brush coat foundation treatment with ammonia-free oxidizing catalyst.

***EMBECO* AGGREGATE**—Plaster coat foundation treatment to reduce permeability.

DIRECTIONS:

1. Clean the surface to be treated; scrub off mud, dirt and loose mortar drippings.

2. Saturate surface with water.

3. With stiff brush, scrub in a wet mixture of 1 part *Metallic Waterproofing* and 3 parts water by volume.

4. When the *Metallic Waterproofing* will not be disturbed by a light spray of water, dampen surface every 3 hours for 24 hours.

5. When *Metallic Waterproofing* has oxidized to a reddish-brown color, saturate surface and brush on mixture of:

1 part *Metallic Waterproofing* (100 lbs.);
3 parts portland cement (282 lbs.—3 bags);
1 part fine sand (100 lbs.);
with sufficient water to make a creamy consistency.

6. Twenty-four hours later, repeat operation 3, followed by operations 4 and 5.

7. Cure—keep brush coat damp for at least 24 hours and protect from direct rays of sun.

8. Wherever the rust color of the finished surface is objectionable, or where a decorative treatment is desired, apply a good cement-base paint.

The four coats described here are usually satisfactory under average water conditions. Under adverse conditions, apply additional coats; under favorable conditions, only 2 coats may be needed.

NOTE: Metallic waterproofing for GSA Specifications is available on special order. Consult you Master Builders field man.

SPIKE-GRIP

An Improved Method of Plugging Worn Spike Holes

DESCRIPTION:

Spike-Grip contains chemically pure, specially graded ground iron combined with a suitable oxidation catalyst and other technical components.

WHERE USED:

For plugging worn spike holes in railroad ties when respiking or regauging rail. For switches, turnouts and curves.

ADVANTAGES OF *SPIKE-GRIP:*

1. Increases holding power of spike.
2. Fills voids around spike.
3. Reduces spike creep.
4. Maintains gauge longer.
5. Prolongs tie life—reduces tie plate movement and cavitation.
6. Helps prevent "spike-killed" ties.
7. Takes immediate load.

ESTIMATING DATA:

For spike hole plugging, 100 lbs. of *Spike-Grip* plugs approximately 400 to 500 holes.

PACKAGING:

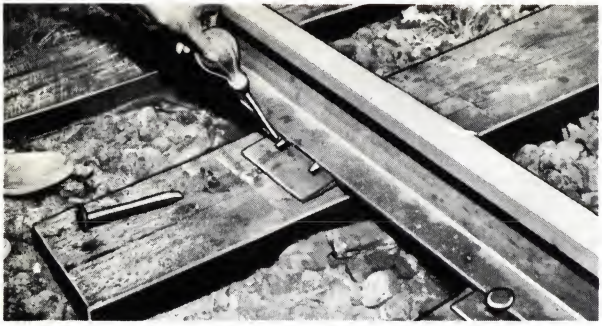
100 lb. bags and 100, 50 and 20 lb. steel pails.

FREIGHT CLASSIFICATION:

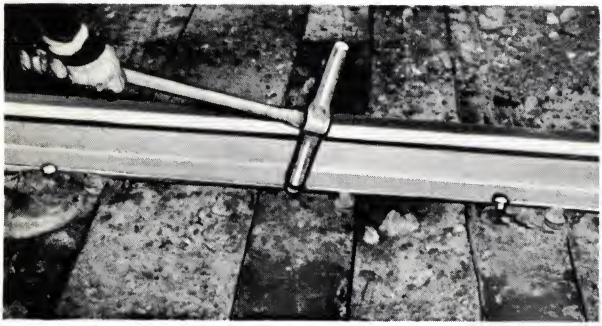
Cement Compound, Building or Floor, Dry.

DIRECTIONS:

1. Fill the hole with *Spike-Grip* to top of tie plate. (If plate is removed, fill to top surface of tie.)



2. Add water—about ¼ ounce (just a few drops) per hole.



3. Redrive the spike in the usual manner—immediately or within a half hour after *Spike-Grip* comes in contact with water.

NOTE: Spikes driven in holes filled with *Spike-Grip* should drive hard. Filling holes to the top is sufficient for ties with fairly sound wood. On old ties, with soft or deteriorated spike hole wood, it may be necessary to tamp slightly more than the usual amount of *Spike-Grip* into the hole, so that spikes will be held firmly.

RUST JOINT IRON

A Dry Packed Grout for Taking Immediate Bearing Loads

DESCRIPTION:

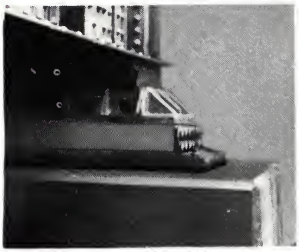
Rust Joint Iron contains chemically pure specially graded ground iron, combined with a suitable oxidation catalyst and other technical components.

WHERE USED:

For regrouting bridge seats and turntables and for any grouting application where the grout must take immediate bearing load.

On work where it is not necessary for the grout to take immediate bearing load, and grout will have time to harden and gain strength, *Embeco* Pre-Mixed Grout is recommended.

ADVANTAGES OF *RUST JOINT IRON:*



Ductility is the prime requirement of bridge seat grout.

1. No waiting period. *Rust Joint Iron* dry-packed grouts carry load immediately after placing.

2. Non-shrinking. Provides bearing beneath entire bedplate.

3. Ductile and tough. Resists impact and pound action.

ESTIMATING DATA:

100 lbs. of *Rust Joint Iron* compacts to a volume of 0.57 cu. ft. To produce one cubic foot of compacted grout requires 175 lbs. of *Rust Joint Iron.*

PACKAGING:

100 lb. bags and 100, 50 and 20 lb. steel pails.

FREIGHT CLASSIFICATION:

Cement Compound, Building or Floor, Dry.

RELATED PRODUCT:

EMBECO* PRE-MIXED GROUT—For non-shrink grouting of bridge seats where it is not necessary for grout to take immediate bearing load.

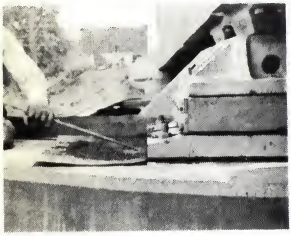
DIRECTIONS:

1. Raise the bridge shoe to the desired elevation by jacking or with wedges. Clean loose concrete and dirt from beneath the seat.

2. Roll the pail of *Rust Joint Iron* prior to opening to insure even distribution of the chemicals.

**Registered trademark.*

Mixing with water.



Rodding with blunt tool.

3. Add only enough water to the required amount of *Rust Joint Iron* to make a mix that is uniformly damp but not wet. One ounce of water per pound of *Rust Joint Iron* or 3 quarts of water per 100 lb. pail is sufficient. Mix on a non-absorbent surface such as sheet metal, to prevent loss of water and chemical ingredients from the mix. *Caution:* Excess water will wash the chemical from the iron and will cause a slower rate of oxidation.

4. Compact the *Rust Joint Iron* beneath the shoe by rodding with a blunt tool. Start at the center of the seat working outward toward the edges, rodding only a small amount at a time to insure a solid grout.

5. Do not extend *Rust Joint Iron* beyond edge of shoe — the unconfined grout will ravel. Rod the *Rust Joint Iron* to the edge of the shoe; dip a trowel in water and smooth the exposed edge to a perpendicular surface.

6. After the *Rust Joint Iron* has thoroughly oxidized (several weeks, depending upon weather conditions), the exposed edges of the grout should be painted with an asphalt-base paint or caulked to protect against weathering.

MASTERQUICK

Iron-Asphalt Patching and Resurfacing Material for Worn Concrete Floors

DESCRIPTION:

*Masterquick** contains specially prepared, size-graded iron aggregate, a drying agent and a suitable asphalt emulsion. It is a two-package unit, one contained within the other, with the iron aggregate and drying agent pre-mixed under factory control.

In use, *Masterquick* is mixed with water, to produce a patching or resurfacing mix of good workability that is trowelled on the floor to any thickness down to a feather-edge. The patched area is ready for traffic in 24 to 36 hours, if directions are carefully followed.

WHERE USED:

For patching and resurfacing worn, pitted or rough concrete—especially desirable for thin application and where feather-edging is required.

Do not use *Masterquick* where it is frequently exposed to oil, grease, water or extremes of temperature.

ADVANTAGES OF *MASTERQUICK:*

Masterquick overcomes the principal weakness of ordinary asphalt patching materials by using ductile iron aggregate in place of brittle sand, silica or ground slag aggregate.

The jagged and angular surfaces of the iron particles in *Masterquick* compact to form a patch that will not rib or roll under heavy traffic. Sand or stone aggregates roll under the trowel. *Masterquick* particles lie flat, permit easy trowelling and feather-edging that will not crush out under heavy loads.

ADVANTAGES OF *MASTERQUICK* FOR PATCHES:

1. No chipping or extensive preparation of floor is required.
2. Easy to apply—any handy man can do the job.
3. Bonds effectively to old, sound concrete surface.
4. May be applied any thickness down to a feather-edge.
5. Does not seriously affect floor levels.
6. Does not rib and roll under traffic.
7. Ready for use in 24 to 36 hours.
8. Freezing in transit not harmful—simply thaw out.
9. Packed in 5-gallon container to facilitate handling and storing.
10. Repaired areas are spark-resistant.

ESTIMATING DATA:

One *Masterquick* unit, 100 lbs. to the 5-gallon pail, will cover:

65 sq. ft. ⅛″ thick
32 sq. ft. ¼″ thick
15 sq. ft. 1″ thick (deep hole mix)

A small amount of *Masterquick* binder is used as a bond coat. One pint covers 50 sq. ft.

**Registered trademark.*

MASTERQUICK

PACKAGING:

5-gallon pail, weight 100 lbs. which contains 84 lbs. of *Masterquick* iron aggregate mix and 2 gals. of *Masterquick* binder. Complete directions for use attached to each pail. For convenience and economy in resurfacing very large areas, *Masterquick* components are available in bulk on special order.

FREIGHT CLASSIFICATION:

Cement Compound, Building or Floor, Dry.

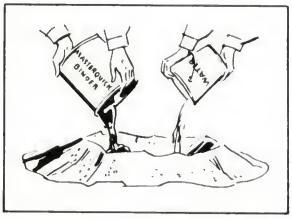
DIRECTIONS:

Masterquick differs in many respects from other patching and resurfacing materials you may have used. These distinctive features of *Masterquick* make for long-life, hard-wearing patches. Follow the simple directions carefully and excellent results will be obtained.

1. CLEAN SURFACE—Remove all dust, dirt and loose concrete. Remove grease, oil and paint with hot water and any good caustic cleaner. Flush thoroughly with clean water.

2. SATURATE WITH WATER—Scrub and saturate surface with clean water. Remove all free water and leave surface damp.

3. APPLY BOND COAT—Dip scrub brush into can of *Masterquick* binder, then scrub it into the surface of the dampened concrete until a thin, uniform, jet black appearance is obtained. (1 pint covers approx. 50 sq. ft.) Apply bond coat at least 6″ beyond area to be patched. Allow to dry until surface becomes dull in appearance.



4. PREPARE MIX—Spread *Masterquick* iron aggregate mix on clean floor as illustrated.

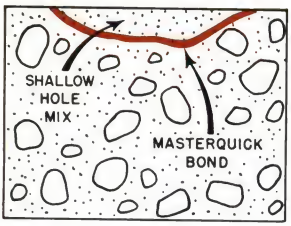
5. ADD BINDER—Add the remainder of *Masterquick* binder and 1 gal. of water.

6. MIX—Mix until uniform in color and consistency.

7. PLACE — Place mix on bond-coated surface with float or trowel. Screed to level with metal screed. *Caution:* Do not place mix where bond coat has not been applied. It will not stick.

8. FINISH—Trowel to a smooth, dense finish but do not overwork surface. Feather the edges, keeping them well within bond-coated area. For best results, give area delayed trowelling after excess water has dried out; then cure with damp burlap if drying conditions are extreme.

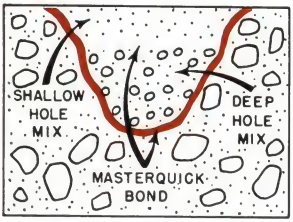
MIX DESIGNS:



SHALLOW HOLES:

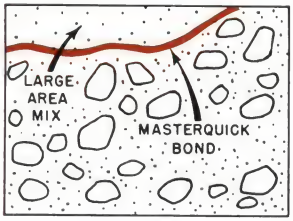
For general use, rough surfaces, ruts, low joints, etc.

Use one 100 lb. *Masterquick* unit (84 lbs. of *Masterquick* iron aggregate mix and 2 gals. *Masterquick* binder) with 1 gal. water. (A small quantity of binder is used as bond coat.)



DEEP HOLES:

Add 6 gals. of pea gravel to Shallow Hole Mix. Mix to very stiff consistency; tamp in hole to within ¼" of level. Apply second bond coat and finish to level with Shallow Hole Mix. For small quantities, proportion accordingly.



LARGE AREAS:

Use Shallow Hole Mix but increase water from 1 gal. to 1½ gal. Place and level but do not overtrowel. When excess water dries out, give floor delayed hard trowelling.

PRECAUTIONS:

1. If *Masterquick* binder freezes in transit, thaw at room temperature for 24 to 36 hours and stir before using.

2. If only a portion of the *Masterquick* is used, reseal the can of emulsion tightly to prevent drying out, then place it in the pail with the remaining iron aggregate mix and replace cover.

3. In mixing, use only the amount of water specified. Too much mixing water causes shrinkage and prolongs setting time.

4. Do not use *Masterquick* where it is frequently exposed to oil, grease, water or extremes of temperature.

INTEGRAL TREATMENTS FOR CONCRETE

INTRODUCTION

Concrete is the only building material manufactured on the job, and—as in any manufacturing process—close quality control at every stage of concrete production is vital. Only then will the end product — the hardened concrete—incorporate the desired properties; only then can it be expected to give long, satisfactory service.

The use for which the concrete is intended determines the particular properties required. To attain concrete with these desired properties, many factors must be considered. Selection of materials and mix proportions; operations such as mixing, handling, placing, compacting, finishing and curing; and job site conditions such as temperature, humidity and wind—all play an important part. Each of them must be closely controlled.

Master Builders' integral treatments for concrete are designed to aid in the control of a number of the conditions encountered in the concrete-manufacturing process. Compressive strength, flexural strength, impermeability, durability and resistance to wear are some of the more common qualities that can be improved through the use of Master Builders' integral treatments.

Chief among these treatments is *Pozzolith**, whose value as an aid in obtaining better quality concrete is recognized by leading architects and engineers in the United States, Canada, Latin America, Japan and many other countries.

Developed by Master Builders Research Laboratories in 1932, *Pozzolith* has been constantly advanced in efficiency through continuing research and field experience. In the 5-year period, 1956-1960, *Pozzolith* was used in more than 145,000,000 cubic yards of concrete in all types of work.

Master Builders field men are the key to the successful use of *Pozzolith.* Master Builders' ability to supply valuable product-use know-how is based upon over 50 years of experience—experience that includes a broad knowledge of materials for concrete in any area. The Master Builders field man is assisted by the company engineering and research staff, and by extensive use of commercial testing laboratories. More than 150 Master Builders field men—in all principal cities—are available to render assistance in solving problems related to concrete.

**Registered trademark.*

A SUMMARY OF THE ACTION AND BENEFITS OF POZZOLITH

POZZOLITH (Normal)

. . . ACTION

Reduces unit water content 15%-20% for a given slump.

Improves aggregate coating, increases cohesiveness and plasticity.

Entrains optimum air content.

Hardens at normal rate for cement used.

. . . BENEFIT

Increased strength — compressive, flexural and bond of concrete to steel.

Economy in a mix for a given strength.

Reduced shrinkage — minimized cracking.

Reduced permeability — greater water resistance.

Easier placement. Economy in placement.

Improved finishing. Better finished appearance.

Resistance to freezing and thawing.

Resistance to scaling from de-icing salts.

Resistance to salt water and sulfates.

POZZOLITH Retarder

Provides action characteristics of *Pozzolith* (Normal) *plus:*

Retarded rate of hardening.

At 90° *Pozzolith* Retarder mix sets similar to plain mix at 70°.

At 70° *Pozzolith* Retarder also delays set. (About 2 hours.)

At 50° *Pozzolith* Retarder does not retard more than plain mixes at the same low temperatures.

Note: Above 90° or for greater retardation, up to 0.35 lbs. of *Pozzolith* Retarder per sack of cement may be used.

Provides all benefits of *Pozzolith* (Normal) *plus:*

Greater flexibility in scheduling of finishing operations for large areas.

Retards set where extended delays between mixing and placement occur.

Provides lubrication plus retardation in pumped and pneumatically placed concrete.

Delays set where re-vibration and re-consolidation are desirable.

Permits full dead-load deflection in bridge decks prior to initial set of slab concrete.

Delays set to eliminate cold joints between successive pours.

Lowers rate of temperature rise in mass concrete.

POZZOLITH High Early

Provides action characteristics of *Pozzolith* (Normal) *plus:*

Accelerated rate of hardening.

With Type I or II cement, develops:

3 day normal strength in 1 day

7 day normal strength in 3 days

28 day normal strength in 7 days — and up to 25% higher ultimate strength.

Provides all benefits of *Pozzolith* (Normal) *plus:*

High early and ultimate strength at lower cost.

Earlier finishing of slabs.

Earlier stripping and re-use of forms as in precast work or rush construction jobs.

Earlier handling of concrete as in lift-slab, and tilt-up jobs.

For cold weather concreting.

For economy and ease of handling in comparison with Type III cement.

For earlier use of concrete as in highway, street and floor patch jobs.

POZZOLITH

For Uniform, Better Quality Concrete

DESCRIPTION:

*Pozzolith** is a water-reducing, set controlling admixture for concrete, added at the mixer. It is based on Master Builders' time tested water reducing agent, combined with agents which modify the kinetics—rates at which chemical reactions proceed — of the portland cement hydration process. *Pozzolith* improves the quality of concrete and increases the user's control of its behavior.

A dry powder, *Pozzolith* is dissolved in water, then added to the concrete mix at the mixer in the recommended amounts. In plastic concrete, *Pozzolith* increases cohesiveness, mobility, and aggregate coating, and gives excellent finishing characteristics, particularly in leaner mixes. In the hardened concrete, it increases strength and durability, and reduces shrinkage and permeability.

Pozzolith is available in several basic formulations to produce the desired results with the different types of aggregates, sands, cements, and under varying climatic conditions of temperature, humidity and wind at the job site.

Your Master Builders field man selects a specific *Pozzolith* formulation, based on his experience with the job-site materials and conditions, or based on preliminary tests made with the materials.

HOW *POZZOLITH* IMPROVES CONTROL OF CONCRETE PROPERTIES:

The use of *Pozzolith* improves control of concrete properties by reducing unit water content, controlling rate of hardening and increasing durability.

1. CONTROL OF WATER CONTENT: *Pozzolith* makes possible lowest water content for a given workability.

The importance of lowest water content in improving the properties of hardened concrete is confirmed by leading concrete authorities and research groups. Here are some representative quotations from current reports of American Concrete Institute committees:

"With given materials, that mix is best which with a given cement content requires the least amount of water per unit volume of concrete." (A.C.I. Committee 611, Manual of Concrete Inspection, 3rd Edition, p. 31.)

"Concrete should be placed with the minimum quantity of mixing water consistent with proper handling, since this will tend to greatly improve its strength, durability and other desirable properties." (A.C.I. Committee 613, Recommended Practice for Selecting Proportions for Concrete, p. 50.)

**Registered trademark.*

2. CONTROL OF RATE OF HARDENING: *Pozzolith* formulations provide desired handling, placing and finishing time under widely varying job conditions. Whether *accelerated, normal* or *retarded* rate of hardening is required, good uniform concrete with all of the improved qualities described in the following pages, is obtained with *Pozzolith.* Charts below based on data obtained by pin pull-out method described in paper, "Measuring the Rate of Hardening of Concrete by Bond Pull-Out Pins", by Kelly and Bryant; ASTM Proceedings, Vol. 57, 1957.

Note: Limit of vibration referred to in these charts is the point during hardening of concrete when it no longer can be reworked or be made plastic by the use of vibrators.

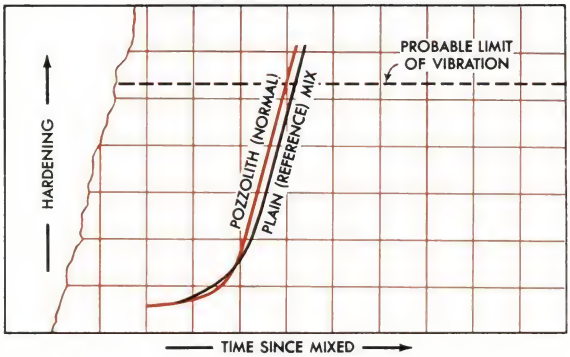


CHART 1: Comparison of rate of hardening at 70°F of POZZOLITH (Normal) and plain mixes designed to same strength.

Normal Hardening (Chart 1): *Pozzolith* (Normal) mix has practically the same rate of hardening as the plain mix of equal strength.

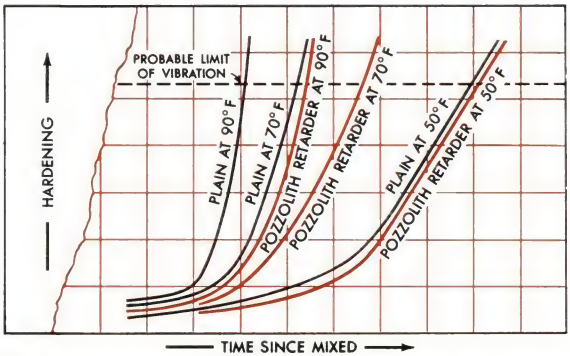


CHART 2: Comparison of rate of hardening at 90°, 70° and 50°F, of POZZOLITH Retarder mixes and plain mixes designed to same strength.

Retarded Hardening (Chart 2): *At 90°:* The *Pozzolith* Retarder mix at 90° has a rate of hardening similar to a plain mix at 70°. Controlled retardation aids in overcoming difficulties in mixing, handling, placing and finishing concrete at high temperatures. Its benefits include:

a. Greater flexibility in the scheduling of finishing operations for large areas. **b.** Overcoming stiffening en route where concrete is transported long distances. **c.** Reduced cracking of concrete slabs and paving from premature stiffening of surface. **d.** Avoiding cold joints between subsequent pours in mass or structural concrete.

At 70°: Pozzolith Retarder provides advantages similar to those above.

At 50°: Pozzolith Retarder is unique in that it does not retard more than plain mixes at the same low temperatures. This safeguards against excessive retardation from an unexpected drop in temperature.

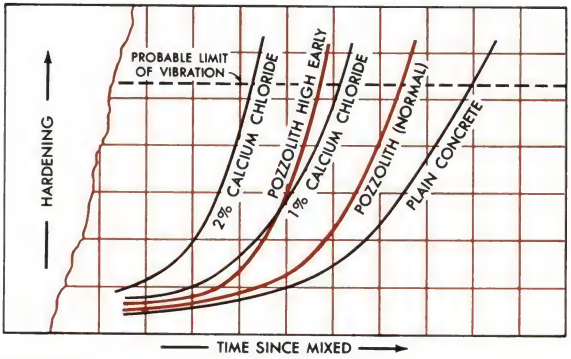


CHART 3: Comparison of rate of hardening at 50°F of POZZOLITH High Early and POZZOLITH (Normal) mixes, with plain and calcium chloride mixes of equal cement content.

Accelerated Hardening (Chart 3): At low temperatures and with equal cement factors, *Pozzolith* (Normal) mixes harden sooner than plain mixes. *Pozzolith* High Early mixes harden more rapidly than 1% calcium chloride mixes. Both *Pozzolith* formulations facilitate earlier finishing.

3. INCREASED DURABILITY: *Pozzolith* used in concrete mixes having the recommended water-cement ratio for the conditions of exposure, and containing 5 to 7% entrained air, provides maximum durability and resistance to scaling because it permits the use of lowest total water content and provides high-strength, low-permeability concrete that is easier to place, handle and finish properly.

Where additional air-entrainment is needed, *Pozzolith* is compatible with all air-entraining agents added at the mixer. Master Builders *MB-VR* and Master Builders *Micro-Air* are recommended.

Where air is excessive, such as when air-entraining sand is encountered or when air-entraining cement is inadvertently used for a non-air-

entraining mix, Master Builders patented air-detraining agent, *ADA*, may be used to reduce the air content to the desired level.

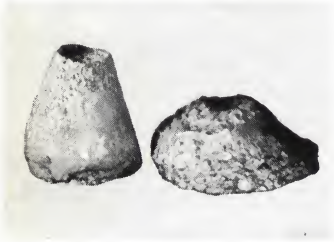
BENEFITS OF *POZZOLITH*:

The effect of the three controls of *Pozzolith* on concrete applied either singly or in combination, are: (a) in the plastic state—increased workability and related benefits; (b) in the hardened state—increased compressive and flexural strength, increased bond strength to steel, reduced shrinkage, reduced permeability, and increased durability.

1. HOW *POZZOLITH* IMPROVES CONTROL OF WORKABILITY:

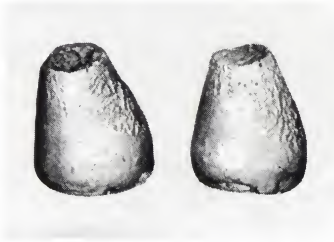
Workability must be controlled, so that a dense, homogenous mass is obtained. *Pozzolith* can improve workability in three ways:

a. For Increased Slump: You can add *Pozzolith* to a plain mix and get up to 150% increase in slump. Benefits include easier placeability, no reduction in strength, easier finishing and a better finished appearance.



POZZOLITH produces greater slump with some water content.

Plain Mix		Pozzolith Mix
6.75 U.S. gals.	W/C	6.75 U.S. gals.
3 inches	Slump	7½ inches



POZZOLITH produces greater workability with less water.

Plain Mix		Pozzolith Mix
6.75 U.S. gals.	W/C	5.43 U.S. gals.
3 inches	Slump	3 inches

b. For Minimum Water Content: You can design a mix with *Pozzolith,* use up to *20% less water,* and get equal slump and greater mobility. At equal slump, concrete produced with *Pozzolith* has better placeability, better aggregate coating, improved cohesiveness, reduced bleeding —up to 50%, and improved properties in the hardened state.

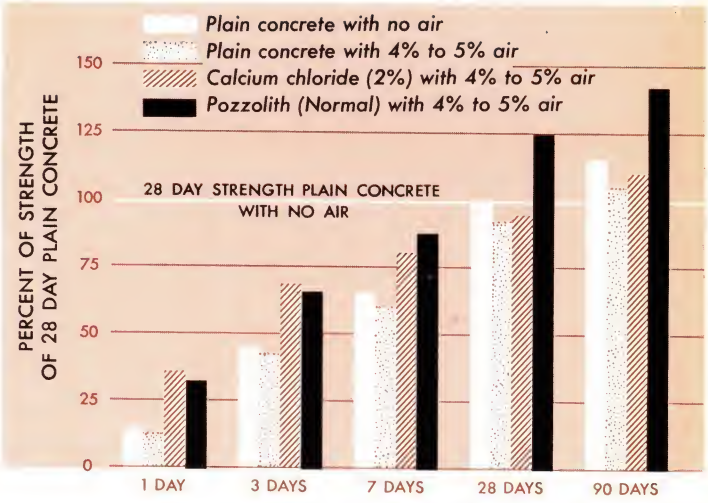
c. For a Combination of These Benefits: You can design a mix with *Pozzolith,* using a water content and slump anywhere between the two mix designs illustrated above that best meet job requirements, and obtain proportionate improvements in the plastic concrete properties and the hardened concrete properties discussed on the following pages.

2. HOW *POZZOLITH* IMPROVES CONTROL OF STRENGTH:

Increased Compressive and Flexural Strengths: Concrete in which *Pozzolith* is employed, with up to 20% less water for a given workability, has these advantages:

a. Up to 25% greater compressive strength and a corresponding increase in flexural strength over both plain and air-entrained concrete.

b. Unlike concrete produced with simple air-entraining agents and accelerators, concrete in which *Pozzolith* is employed has increased strength at all ages (see chart).



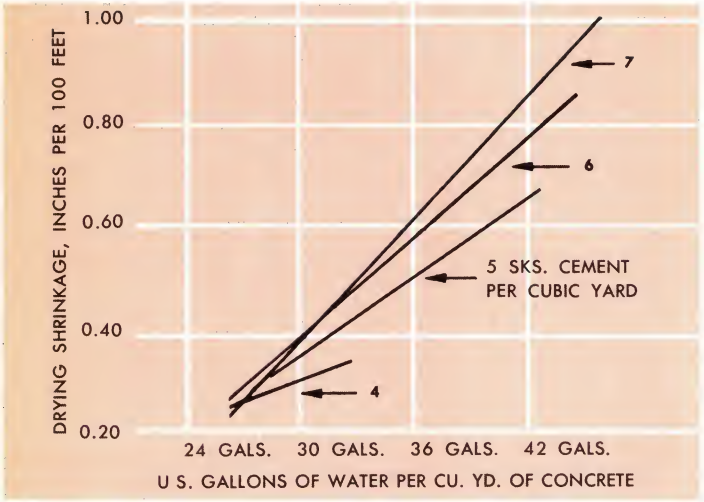
POZZOLITH increases strength at all ages. (Chart based on averages obtained from test data by the following laboratories: Smith-Emery Company, Pittsburgh Testing Laboratory; The Warnock-Hersey Co. Ltd., Shilstone Testing Laboratory, University of Alberta, Southwestern Laboratories, and others.)

Greater Bond Strength to Steel: Concrete in which *Pozzolith* is employed has up to 40% greater bond to steel, as shown in chart. This makes practical the use of air-entrained *Pozzolith* concrete in heavily reinforced exposed structures. (Data below from tests reported in A.C.I. Journal, Feb. 1946, p. 311.)

%	4½ BAGS OF CEMENT PER CU. YD.
121	POZZOLITH CONCRETE—430 PSI
100	PLAIN—354 PSI
76	AIR-ENTRAINED—270 PSI
%	6 BAGS OF CEMENT PER CU. YD.
141	POZZOLITH CONCRETE—582 PSI
100	PLAIN—412 PSI
100	AIR-ENTRAINED—412 PSI

3. HOW *POZZOLITH* IMPROVES CONTROL OF VOLUME CHANGE:

Drying shrinkage is affected principally by total water content and air content. It is also affected to a smaller degree by other factors such as cement content, and amount and type of aggregate.



Pozzolith reduces unit water content, and this undoubtedly accounts for the marked reduction in shrinkage and shrinkage cracks observed over the years in structures built with *Pozzolith* concrete as compared with non-treated concrete.

4. HOW *POZZOLITH* IMPROVES CONTROL OF PERMEABILITY:

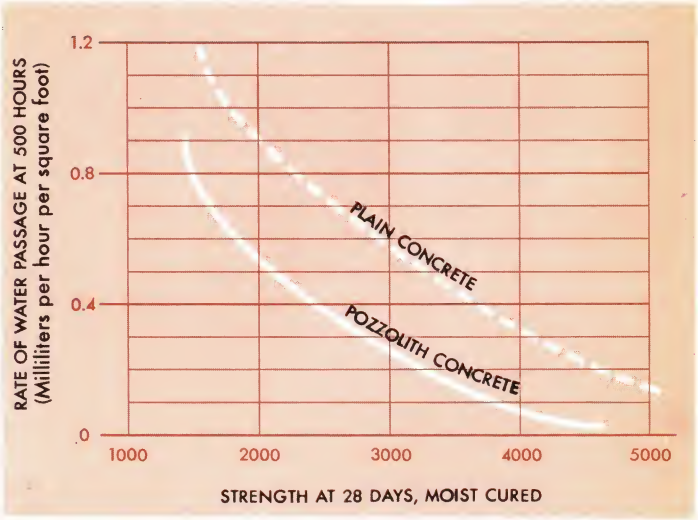
Studies by the Bureau of Reclamation, the Corps of Engineers and others show that permeability is related directly to water content. Approximately 2 gallons of water per bag of cement are required to hydrate the cement. The balance —"excess" water — is necessary only to provide workability for placement purposes.

The excess water bleeds from the mass, and in so doing forms voids and a network of thread-like interconnecting passages. Water re-enters these passages in the hardened concrete. Any decrease in total water means a decrease in the size and number of these passages. The problem is how to decrease water without affecting the workability and placeability of the concrete.

Pozzolith makes possible lowest water content for a given workability, and thereby reduces the network of capillaries and voids. This also reduces shrinkage and shrinkage cracks and thus further lowers permeability of the concrete.

Professor W. M. Dunagan of Iowa State College investigated the comparative permeability of plain and *Pozzolith* concrete and reported the results shown in the accompanying chart. Reports of other investigators,

including The University of Alberta, Rush Engineering Co., and the Panama Canal Co., confirm Professor Dunagan's findings.

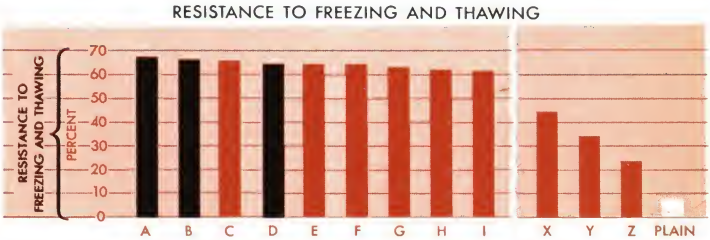


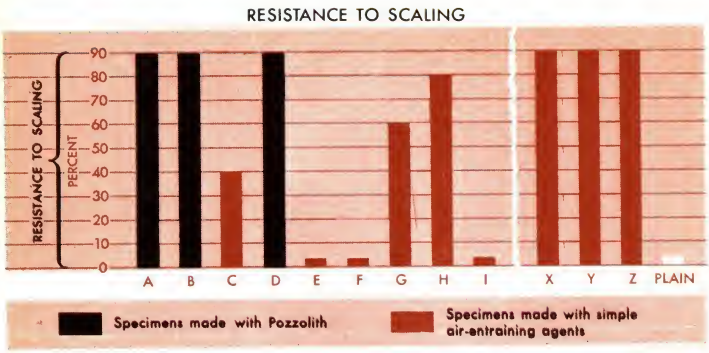
Passage of water through POZZOLITH concrete was 60% to 80% less than through plain concrete, according to tests by Professor Dunagan. (Chart based on data from Proceedings ASTM Vol. 39, 1939, pp. 866-880.)

5. HOW *POZZOLITH* IMPROVES DURABILITY:

The U.S. Bureau of Public Roads conducted a comprehensive durability test program involving 26 air-entraining agents, to determine their effect in resistance of concrete to both freezing and thawing and to scaling from de-icing salts. Charts on following page show typical results of these tests. It will be noted that *Pozzolith* concrete has superior durability in resistance to both freezing and thawing and to scaling.

The exceptional durability of *Pozzolith* concrete has been observed time and again in structures and pavement exposed to severe weathering conditions.





6. HOW *POZZOLITH* IMPROVES APPEARANCE:

Pozzolith is a substantial aid to improving cohesiveness and plasticity, and thereby helps to avoid honeycombing and other segregation defects. The problems of sand-streaking and cold joints are also minimized or more easily overcome with *Pozzolith.* Because of these advantages, enhanced appearance of exposed concrete is another benefit resulting from the controls obtained with *Pozzolith.*

POZZOLITH (Normal)

For Control of Water and Air and to Produce Normal Rate of Hardening

DESCRIPTION:

*Pozzolith** (Normal) is the standard *Pozzolith* formulation. It provides all of the advantages of *Pozzolith* and is employed where normal rate of hardening is required.

WHERE USED:

In concrete for all types of structures except where modified rates of hardening are desired and for specialized operations such as mass concrete, prestressed concrete, etc., where other *Pozzolith* formulations may provide greater advantages.

ESTIMATING DATA:

Use ¼ lb. of *Pozzolith* (Normal) per bag of cement.

To facilitate addition to the mix, *Pozzolith* is dissolved in water. Dissolve *Pozzolith* so that each quart of solution contains ¼ lb. of *Pozzolith.*

PACKAGING:

50 lb. moisture-proof paper bags.

FREIGHT CLASSIFICATION:

Concrete or Masonry Plasticizer and Water Reducing Compound.

STANDARD SPECIFICATION:

An approved independent testing laboratory shall prepare the mix designs for the classes of concrete specified for use in the contract. The concretes shall be homogeneous, readily placeable and uniformly workable and shall be designed in accordance with ACI 613 employing *Pozzolith,* manufactured by The Master Builders Co., Cleveland, Ohio, to reduce total water content and to improve or control the specific qualities herein and elsewhere required as to (a) workability, (b) entrained air content, (c) rate of hardening (retarded, normal or accelerated, as the case may be), and (d) compressive and/or flexural strength.

RELATED PRODUCTS:

***POZZOLITH* RETARDER**—Water-reducing, air-entraining admixture for producing retarded rate of hardening.

***POZZOLITH* HIGH EARLY**—Water-reducing, air-entraining admixture for producing accelerated rate of hardening.

MB-VR—air-entraining admixture for concrete.

MASTERKURE*—Membrane curing compound.

DIRECTIONS:

See your Master Builders man for complete instructions.

PRECAUTIONS:

1. In the warehouse and on the job site, store and protect *Pozzolith* as you do cement.
2. Where *Pozzolith* is to be used with other than standard portland cement (Type I, ASTM C-150), contact the Master Builders field man, especially where high air-entraining cements are encountered.
3. Do not use *Pozzolith* in excess of the amount prescribed.
4. Always stir or agitate *Pozzolith* solution before using.
5. Protect *Pozzolith* solution from freezing.

**Registered trademark.*

POZZOLITH Retarder

For Control of Water and Air and to Produce Retarded Rate of Hardening

DESCRIPTION:

Where a retarded rate of hardening is required, *Pozzolith** Retarder provides the advantages of *Pozzolith* plus low rate of heat evolution at early ages.

WHERE USED:

Pozzolith Retarder is a positive aid in placing and finishing relatively thin concrete sections (pavements, bridge decks, sloping slabs, etc.) particularly where high temperatures and hot sand and aggregates are encountered.

For mass concrete, *Pozzolith* Retarder meets the placing requirements in that: (1) it permits design of the concrete mix with reduction in total heat evolved and lower temperature peaks; (2) total water content may be substantially reduced with *Pozzolith* Retarder without reducing slump or workability; and (3) danger of cold joints is greatly minimized by the delay in hardening provided by *Pozzolith* Retarder.

In hot weather, delayed hardening of the concrete reduces finishing difficulties.

ESTIMATING DATA:

Pozzolith Retarder is usually used at the rate of ¼ lb. per bag of cement. The amount may be increased if greater retardation is required. Do not use more than 0.35 lb. per bag of cement until tests have been made with actual materials for the job, under the temperature and humidity conditions that will prevail.

PACKAGING:

50 lb. moisture-proof paper bags.

FREIGHT CLASSIFICATION:

Concrete or Masonry Plasticizer and Water Reducing Compound.

STANDARD SPECIFICATION:

An approved independent testing laboratory shall prepare the mix designs for the classes of concrete specified for use in the contract. The concretes shall be homogeneous, readily placeable and uniformly workable and shall be designed in accordance with ACI 613 employing *Pozzolith,* manufactured by The Master Builders Co., Cleveland, Ohio, to reduce total water content and to improve or control the specific qualities herein and elsewhere required as to (a) workability, (b) entrained air content, (c) rate of hardening (retarded, normal, or accelerated, as the case may be), and (d) compressive and/or flexural strength.

**Registered trademark.*

RELATED PRODUCTS:

***POZZOLITH* (Normal)**—Water-reducing, air-entraining admixture for producing normal rate of hardening.

***POZZOLITH* HIGH EARLY**—Water-reducing, air-entraining admixture for producing accelerated rate of hardening.

MB-VR—Air-entraining admixture for concrete.

MASTERKURE*—Membrane curing compound.

DIRECTIONS:

See your Master Builders man for complete instructions.

PRECAUTIONS:

1. In the warehouse and on the job site, store and protect *Pozzolith* Retarder as you do cement.

2. When *Pozzolith* Retarder is to be used with other than standard portland cement (Type 1, ASTM C-150), contact the Master Builders field man, especially where high air-entraining cements are encountered.

3. Do not use *Pozzolith* Retarder in excess of the amount prescribed except on the advice of the Master Builders field man.

4. Always stir or agitate *Pozzolith* Retarder solution before using.

5. Protect *Pozzolith* Retarder solution from freezing.

PRESTRESSED WORK WITH *POZZOLITH* RETARDER:

In prestressed work, *Pozzolith* Retarder has the distinct advantage of: (1) higher 24 hour strength, which permits early release of tension and removal from forms, and (2) initial delay in hardening (1 to 2 hours), allowing complete consolidation of the concrete in prestressed units carrying large amounts of steel. The smooth, relatively crack-free surface provided by *Pozzolith* Retarder is especially desirable in prestressed work. (Consult your Master Builders man for the type of *Pozzolith* recommended for prestressed work.)

POZZOLITH High Early

For Control of Water and Air and to Produce Accelerated Rate of Hardening

DESCRIPTION:

Where an accelerated rate of hardening is required, *Pozzolith** High Early provides the advantages of *Pozzolith* (Normal) plus high strengths at early ages.

- 3-day normal strength in 1 day
- 7-day normal strength in 3 days
- 28-day normal strength in 7 days
- Up to 25% greater than normal strength thereafter

**Registered trademark.*

POZZOLITH HI-EARLY

WHERE USED:

1. In all concrete and concrete products where high early strength is required.

2. In winter concreting, to reduce the period of heat protection.

3. In formed work, to permit earlier stripping and, consequently, more rapid completion of the job. Also, an earlier setting may be desirable to avoid too great a pressure on the forms at the bottom of the pour.

4. In floor construction, to provide more rapid hardening, thus permitting earlier finishing.

5. For use with standard portland cement as a substitute for high early strength cement (Type III), thus making unnecessary the stocking of both normal portland and high early strength cements. *Pozzolith* High Early added to normal portland cement produces the desired high early strength at a saving in cost.

6. In industrial plants, high early strength prevents lengthy shutdowns. In railroad work, it prevents costly traffic delays.

ESTIMATING DATA:

Use ½ lb. of *Pozzolith* High Early per bag of cement.

To facilitate addition to the mix, *Pozzolith* High Early is dissolved in water. Dissolve *Pozzolith* so that 1 quart of solution contains ½ lb. of *Pozzolith* High Early.

PACKAGING:

50 lb. moisture-proof paper bags.

FREIGHT CLASSIFICATION:

Concrete or Masonry Plasticizer and Water Reducing Compound.

STANDARD SPECIFICATION:

An approved independent testing laboratory shall prepare the mix designs for the classes of concrete specified for use in the contract. The concretes shall be homogeneous, readily placeable and uniformly workable and shall be designed in accordance with ACI 613 employing *Pozzolith,* maunfactured by The Master Builders Co., Cleveland, Ohio, to reduce total water content and to improve or control the specific qualities herein and elsewhere required as to (a) workability, (b) entrained air content, (c) rate of hardening (retarded, normal or accelerated, as the case may be), and (d) compressive and/or flexural strength.

RELATED PRODUCTS:

***POZZOLITH* (Normal)**—Water-reducing, air-entraining admixture for producing normal rate of hardening.

***POZZOLITH* RETARDER**—Water-reducing, air-entraining admixture for producing retarded rate of hardening.

MB-VR—Air-entraining admixture for concrete.

MASTERKURE*—Membrane curing compound.

DIRECTIONS:

See your Master Builders man for complete instructions.

**Registered trademark.*

PRECAUTIONS:

1. In the warehouse and on the job site, store and protect *Pozzolith* High Early as you do cement.
2. When *Pozzolith* High Early is to be used with other than standard portland cement (Type I, ASTM C-150), contact the Master Builders field man, especially where air-entraining cements are encountered.
3. Do not use *Pozzolith* High Early in excess of the amount prescribed.
4. Always stir or agitate *Pozzolith* High Early solution before using.
5. Protect *Pozzolith* High Early solution from freezing.

POZZOLITH AND DURABLE CONCRETE

Technical Considerations: Concrete pavements, parking areas, walks and curbs are frequently subjected to severe exposure. Excessive use of deicing agents, frequent freezing and thawing, frequent wetting and drying, or cycles of extreme variations in temperature contribute to surface scaling and disintegration of concrete. Air-entrained concrete has demonstrated good resistance to scaling and disintegration, but maximum resistance to scaling and greatest durability can be achieved only when adequate air entrainment is combined with quality materials in properly proportioned concrete mixes of low water-cement ratios, low total water content and with proper mixing, placing, finishing, curing and protection practices. For best results, the following "Do's" and "Don'ts" should be observed:

DO'S:

Do specify 5 to 7% entrained air. With 1½" top-size aggregate, air content in the 5-6% range is required. For ¾" to 1" top-size aggregate, entrained air should be in the 6-7% range.

Do specify high-strength concrete. While relatively low-strength concrete may serve the structural requirements, durability is secured only with low water-cement ratios producing low permeability and high-strength concrete.

Do specify quality and tested materials. Fine and coarse aggregate should meet ASTM C-33 or have a suitable service record. The cement should meet ASTM C-150, C-175, or C-205, should be of normal temperature at time of delivery and have no false or flash setting tendency.

Do specify good workmanship. Proper placing and finishing are absolutely essential in obtaining long-wearing surfaces. The quality of the concrete at the surface should be the same as it is throughout the depth of the slab.

Do specify proper curing. Keeping concrete moist and at an adequate temperature for as long as possible helps to provide proper hydration of the cement and maximum strength. More complete hydration and higher strength mean greater resistance to scaling. Curing compounds of high quality, properly applied are adequate.

Do specify a surface sealer, at least on new concrete. Surface treatments of oil increase resistance of concrete to scaling. One such treatment consists of applying boiled linseed oil to the clean, dry concrete surface. The use of mineral oils is equally acceptable.

DON'TS:

Don't assume that air entrainment alone is enough. Good aggregates, good cement, good workmanship, curing and protection are needed with air entrainment to produce durable concrete.

Don't permit the addition of water to the concrete. Adding water lowers strength and increases absorption, permeability and likelihood of scaling. If increased workability is required, have the concrete mix altered at the batching plant.

Don't permit the use of materials of questionable quality. Coarse aggregates with a high percentage of unsound particles will contribute to "pop-outs" and scaling. Cement that fails to meet the specification for false or flash setting tendencies at the time of use can contribute to scaling and early disintegration.

Don't permit overworking of the concrete. Excessive or premature floating and darbying, particularly with metal tools, contributes to bleeding and reduces air content and durability of the surface. Swirled or smooth surfaces may be obtained using hand floats or trowels after the concrete has stiffened.

Don't allow concrete to dry after finishing. Concrete should be kept moist during the entire curing period. Alternate wetting and drying during the early age of concrete will cause crazing and increase the possibility of scaling. As much as 50% of the potential strength of concrete can be lost through improper curing.

Don't allow the application of salt to new, unsealed concrete. Unsealed concrete that is less than one year old may scale from the effects of salt. Where the presence of de-icing agents cannot be eliminated, even by the most remote exposures (e.g. drippings from automobiles, etc.) the concrete surface must be treated with a sealer prior to the first winter, if scaling is to be avoided.

THE FUNCTION OF *POZZOLITH* IN PRODUCING DURABLE CONCRETE: Master Builders *Pozzolith,* used in concrete mixes having the recommended water-cement ratio for the conditions of exposure, and containing 5 to 7% entrained air, provides maximum durability and resistance to scaling because it permits the use of lowest total water content and provides high-strength, low-permeability concrete that is easier to place, handle and finish properly. In many cases, *Pozzolith* alone will provide the necessary air content. Where additional air entrainment is needed, *Pozzolith* is compatible with all air-entraining agents added to the mixer. Master Builders *MB-VR* and Master Builders *Micro-Air* are recommended. There is not the loss in strength with *Pozzolith* in the mix that occurs when only ordinary air-entraining agents are used.

POZZOLITH AND LIGHTWEIGHT CONCRETE

Technical Considerations: There are problems in the production of a uniform quality concrete that are inherent in the use of lightweight aggregates. Some of these problems and suggested remedial practices are listed below:

1. Special mix design procedure is required.
   - Select a laboratory having personnel familiar with up-to-date lightweight mix design methods and having proper equipment.
2. Lightweight aggregate mixes require more water than normal aggregates for equal placeability, increasing drying shrinkage.
   - Use a water reducing, air entraining admixture.
3. Variation in specific gravity is unavoidable in the manufacture of expanded aggregates.
   - Select aggregate with best record for uniformity.
4. Aggregate segregates during handling due to different bulk specific gravity of each screen size of the aggregate.
   - Keep aggregate surface moist.
5. Lightweight concrete segregates due to tendency of the larger, lighter sizes to rise to the surface.
   - Use low slump concrete with the proper percentage of entrained air.
6. Slump of successive loads varies due to variation in moisture content of aggregate.
   - Make moisture checks at least hourly during batching. Make proper correction of batch weights. Mix lightweight aggregate and two-thirds of designed mixing water for a short period of time (to partially saturate the aggregate) before adding cement and admixture.
7. Yield varies due to changes in moisture content and bulk specific gravity of lightweight aggregate.
   - Check loose weight per cubic foot at frequent intervals during batching and make corresponding corrections in batch.
8. Overmixing may cause pulverizing of the aggregate.
   - Determine proper mixing time for particular aggregate being used.

FUNCTION OF *POZZOLITH* IN LIGHTWEIGHT CONCRETE:

- Reduces mixing water required for a given slump by 10% to 20%.
- Reduces or eliminates segregation in placement.
- Provides maximum plasticity and workability.
- Entrains optimum amount of air for lightweight aggregate concrete.

SUGGESTED SPECIFICATION CLAUSES:

Lightweight aggregate concrete, having low slump and good workability, shall be designed for the required strength and weight per cubic foot by a testing laboratory approved by the structural engineer.

Pozzolith, manufactured by the Master Builders Company, Cleveland, Ohio, shall be used in all lightweight aggregate concrete to reduce mixing water requirement and to provide the percentage of entrained air necessary for cohesion and workability of the plastic concrete.

The lightweight aggregate used shall have a record of satisfactory performance under similar requirements.

Provision shall be made for moisture and bulk specific gravity tests of the aggregate during batching, and appropriate batch weight corrections made.

Lightweight aggregate and two-thirds of the designed mixing water shall be mixed together for a short period of time prior to introduction of cement and *Pozzolith.*

Lightweight aggregate concrete mixture shall not be subjected to prolonged mixing, and delivery of concrete to the job site shall be scheduled so as to preclude delay between batching and placing.

POZZOLITH AND HOT WEATHER CONCRETING

THE PROBLEM: At high temperatures, concrete sets too rapidly and with hot, drying winds there is very rapid evaporation of moisture. These factors introduce difficulties in handling, placing, finishing and curing operations. Unless precautions are taken, there is permanent reduction in strength, plus other structural problems.

TECHNICAL CONSIDERATIONS: ACI 605 "Recommended Practice For Hot Weather Concreting" contains important information for the architect, engineer, contractor and ready-mixed producer. The following important aspects warrant special consideration.

1. Modify the Surrounding Conditions

Strive to lower the temperature of the area in which concrete is to be placed.

- Forms, reinforcing steel and subgrade should be sprayed periodically with water to keep them cool and to prevent absorption, once the concrete is placed.
- Sunshades help protect the concrete from direct sun and hot, drying winds. This minimizes plastic shrinkage, cracks and crazing of fresh concrete.

2. Modify Temperature of the Mix

Strive to lower the temperature of the materials (water, coarse aggregate, fine aggregate and cement).

- The temperature of freshly-placed concrete in hot weather should not be *more than* 90° F. Use of crushed ice in the mix, replacing water pound-for-pound, is helpful.
- It may also be necessary to cool the aggregate.
- Avoid the use of "hot" cement.

3. Modify the Setting Time by Using a Retarder

The proper use of a good retarder can provide greater flexibility in handling, placing and finishing operations.

- The retarder corrects the primary cause of hot weather concreting problems—rapid setting.

4. Modify the Placing and Finishing Schedule

The contractor should carefully schedule delivery and placing.

- Discharge concrete from the truck within 15 minutes after its arrival at the job.
- Advise ready-mix producer immediately of any change in placing schedule.
- Provide sufficient manpower to proceed with finishing operations immediately after placing.

5. Adjust the Curing Conditions

Strive to maintain proper curing conditions (both temperature and moisture).

- Cure immediately to prevent moisture evaporation from the concrete during the first crucial hours after finishing. Continuous curing for at least 7 days is essential. Ponding, paper or other waterproof coverings, white pigmented or membrane curing compounds are most effective.
- Exteriors of forms should be sprayed with cool (but not cold) water at an early age. Do not rely on forms alone for curing during hot weather. Tops of walls, columns and other vertical elements should be wet-cured and covered.

6. Be Sure to Use Proper Test Procedures

- Immediately after test specimens are molded, they should be covered with burlap and kept damp at 60° F. to 80° F. After 24 hours, the specimens should be carefully transported to standard curing facilities.

FUNCTION OF *POZZOLITH* RETARDER IN HOT WEATHER CONCRETING:

- Provides controlled rate of hardening with no loss of design strength.

  At 90° F., concrete containing *Pozzolith* Retarder has about the same setting time as a plain mix at 70° F.

  At 70° F., it delays the set about 2 hours.

  At 50° F., it does not retard the setting time more than a plain mix at the same low temperature. (*Pozzolith* Retarder is unique in that it *automatically safeguards* against excessive retardation from an unexpected drop in temperature.)
- Provides desired time for finishing large areas or for extended delays between mixing and placing operations.
- Provides lubrication, plus retarded set in pumped and pneumatically-placed concrete

- Delays set effectively where re-vibration and re-consolidation are necessary.
- Permits full dead-load deflection in bridge decks, prior to initial set of slab concrete.
- Delays set to eliminate cold joints between successive pours.

PLUS . . . all the other inherent benefits which *Pozzolith* provides through a maximum reduction of unit water content and its control of air entrainment: greater workability, reduced shrinkage, reduced permeability, greater durability . . . at lowest cost-in-place.

SUGGESTED SPECIFICATION CLAUSES:

Design of mixes: When job placing conditions with respect to humidity and temperature differ from standard laboratory conditions, to the point where problems are encountered, the contractor at his expense shall have an approved testing laboratory prepare mix designs for the various classes of concrete with rates of hardening modified to adapt the concrete to the existing conditions. These modified designs shall be submitted to the engineer (architect) for approval.

Admixture: *Pozzolith* shall be used in accordance with the manufacturer's recommendations to secure maximum reduction in unit water content and to control the entrainment of air and rate of hardening (normal, retarded or accelerated, as required).

Hot Weather Curing: Protection against drying and excessive concrete temperature shall be provided for the first 7 days, especially in columns and other thick sections. Water at a lower temperature than the concrete (but not cold) shall be applied to all formed and exposed concrete surfaces, no reliance being placed on form work alone, for curing. Where permitted, a curing compound shall be applied, care being taken that the concrete shall not be dried prior to its application.

POZZOLITH AND COLD WEATHER CONCRETING

TECHNICAL CONSIDERATIONS: Problems involved in producing uniform quality concrete during cold weather can be easily overcome if these established fundamentals are followed.

When the temperature of the concrete is below 70° F, it sets more slowly and the development of the strength is delayed. Below 50° F, delay of the set is pronounced and early strengths are sharply reduced. At slightly below 32° F, concrete will not set.

To provide normal performance characteristics for concrete in cold weather, it is necessary that one or more (depending on temperature and exposure) of the following practices be employed:

1. Raise temperature of area in which concrete is to be placed.

- Raise to above freezing the temperature of forms, adjacent concrete and subgrade . . . avoid the presence of ice or the possibility of its formation during concreting.
- Slabs lose moisture and/or heat rapidly in cold weather atmospheres. Protect from wind and rapid moisture loss . . . provide heated enclosure if necessary to keep concrete temperature above 50° F. Avoid working of cooled slabs having delayed set . . . don't get on slabs too soon.

2. Raise the temperature of materials (water, coarse aggregate, fine aggregate).

- The temperature of freshly placed concrete in cold weather should be at least 50° F and not more then 90° F. In addition to heating water, it may be necessary to heat aggregates. When heated materials are used in concrete mixes, add cement last—to prevent flash sets.
- Generally, the temperature of the average concrete mix can be raised *one degree* by making . . .

a 9° increase in temperature of cement
a 3.6° increase in temperature of water
a 1.6° increase in temperature of aggregate.

3. Utilize materials (cements, accelerators, etc.) that promote development of high early strength concrete.

- Water-reducing agents reduce water/cement ratio and produce high early strength concrete.
- Additional cement (with no increase in water content in the mix) reduces the water/cement ratio and produces high early strength concrete . . too high a cement content may be objectionable.
- High early strength cement (Type III) produces high early strength concrete . . . it does not make concrete set more rapidly.
- Calcium chloride in amounts up to 2% by weight of cement, and other chloride-type accelerators, make concrete set more rapidly and produce high early strength concrete . . . they should not be considered as "anti-freeze" for concrete since chloride lowers the freezing point only a few degrees.
- A combination of materials, such as a water-reducing agent and calcium chloride, promote early setting and early strength development.

4. Maintain proper curing conditions (both temperature and moisture).

- Provide insulation or heated enclosure to maintain concrete temperatures for minimum periods as shown:

TEMPERATURE OF CONCRETE	70° F	OR	50° F
Plain Concrete	3 days		7 days
High Early Strength Concrete	2 days		3 days

After these periods, maintain concrete temperature above 40° F for at least 4 days. *Do not allow concrete to dry.*

(CAUTION: After curing and attainment of strength, remove the protection in such a manner that the temperature of the concrete will not drop faster than 40° F in 24 hours.)

- Curing and protection, from start to finish should be continuous and uninterrupted until concrete develops its designed strength. Concrete in both its fresh and hardened state loses moisture and/or heat rapidly to cold weather air which normally has great moisture absorption capacity. This easy drying-out of cold weather concrete can stop strength gain . . . avoid it!

FUNCTION OF *POZZOLITH* IN COLD WEATHER CONCRETING:

- Available in both *Pozzolith (Normal)* and *Pozzolith High Early* formulations for close control of setting time and rate of early strength development.
- Reduces unit water content 10% to 20% for a given slump. Makes a corresponding reduction in water/cement ratio resulting in 20% to 30% increase in strength of concrete at all ages—including the critical age for cold weather concreting.

  Pozzolith (Normal) plus normal portland cement produces higher strength concrete and thus higher strength at early ages than a comparable plain concrete.

  Pozzolith High Early plus normal portland cement produces

  3 day normal strength in 1 day *7 day normal strength in 3 days*

  28 day normal strength in 7 days and up to 25% higher ultimate strength

- Produces all the other benefits derived from *Pozzolith.*

SUGGESTED SPECIFICATION CLAUSES:

When job site temperatures drop below 50° F, the contractor and concrete producer shall institute cold weather concreting precautions and practices in accordance with the ACI Standard Recommended Practice for Winter Concreting (ACI 604).

Pozzolith, manufactured by The Master Builders Company, Cleveland, Ohio, shall be used in all concrete to reduce the mixing water requirement and to control the rate of hardening in keeping with specifications requirements and prevailing job site temperatures.

Cylinders used as a basis for the acceptance of concrete as delivered to the structure must be transferred at the age of one day to a location (usually the testing laboratory) where they will receive continuous standard moisture curing until test.

Concrete cylinders stored at the job site for the purpose of determining when forms can be stripped, jacks removed, etc., shall have the same curing conditions as the sections represented by the test specimens.

RECOMMENDED
COLD WEATHER CONCRETING
PROCEDURE

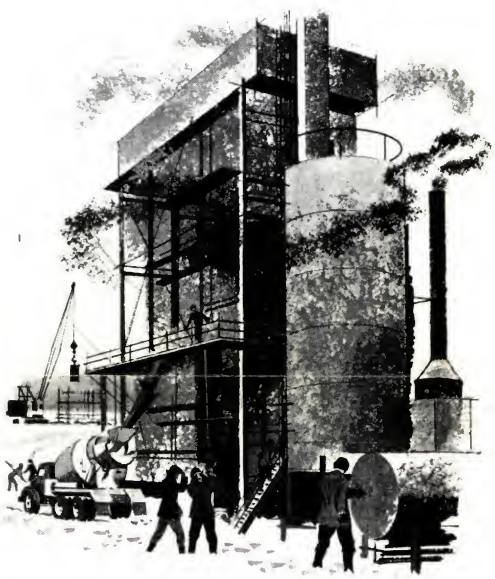
PREPARED BY THE MASTER BUILDERS COMPANY... IN THE INTEREST OF BETTER CONCRETING PRACTICES

NOTE: *For Additional Information, See ACI Standard Recommended Practice for Winter Concreting (ACI-604-56)*

At low temperatures concrete sets slowly and development of strength is delayed. Therefore, job planning for cold weather concreting should include one or more of the following recognized protective measures:

- Heating the water and concrete materials (See other side.)
- Heating the area in which the concrete is placed.
- Addition of calcium chloride to the mix.
- Use of high early strength cement.
- Special provisions for curing.

(Even when using POZZOLITH concrete, the above protective measures are indicated. However, the addition of POZZOLITH to a plain concrete mix reduces water and increases strength . . . and is highly recommended for cold weather concreting with these measures.)

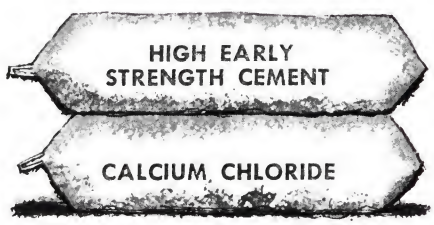


HEATING AGGREGATES

TIPS ON COLD WEATHER CONCRETING

1. Raise to above freezing the temperature of forms, adjacent concrete and subgrade; avoid the presence of ice or the possibility of its formation during concreting.

2. The temperature of freshly placed concrete in cold weather should be at least 50F and not more than 90F. See chart on reverse side for temperature control of concrete mixes. *(CAUTION: In addition to heating water, it may be necessary to heat aggregates. When heated materials are used in concrete mixes, add cement last to prevent flash sets.)*



3. Use calcium chloride or high early strength cement to speed up set of concrete and gain in strength when moderately low temperatures are expected. Calcium chloride, up to 2% by weight of cement, is often recommended.

(CAUTION: Don't depend on chemicals or special cements alone when air temperatures drop below 50F.)

4. Slabs lose moisture and/or heat rapidly in cold weather atmospheres. Protect from wind and rapid moisture loss; provide heated enclosure if necessary to keep concrete temperatures above 50F. Avoid overworking of cooled slabs having delayed stiffening; don't get on slabs too soon.

5. Provide insulation or heated enclosure to maintain concrete temperatures for minimum periods as shown:

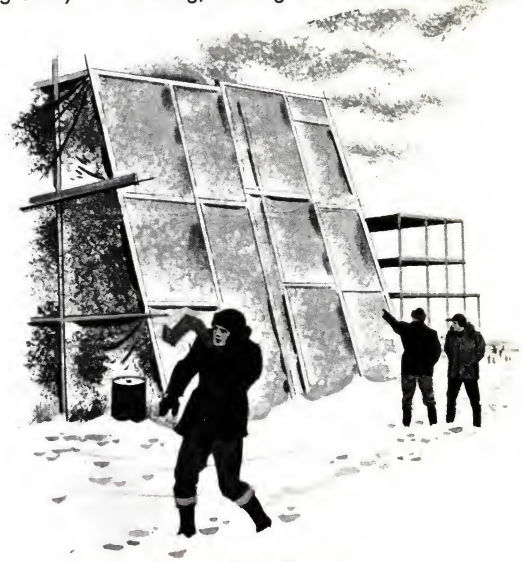
TEMPERATURE OF CONCRETE

	70F	50F
Plain Concrete	3 days	7 days
Plain Concrete with Calcium Chloride	2 days	3 days
High Early Strength Concrete	2 days	3 days

After periods shown above, maintain concrete temperature above 40F for at least four days. *Also, do not allow concrete to dry.*

(CAUTION: After curing and attainment of strength, remove the protection in such a manner that the temperature of the concrete will not drop faster than 40F in 24 hours.)

6. Curing and protection from start to finish should be continuous and uninterrupted until concrete develops its designed strength. Concrete in both its fresh and hardened state loses moisture and/or heat rapidly to cold-weather air which normally has great moisture absorption capacity. This easy drying out of cold-weather concrete can stop strength gain; avoid it!



PROVIDE HEATED ENCLOSURE

RECOMMENDED
HOT WEATHER CONCRETING

In addition to the following information on placing, finishing and curing concrete during hot weather, consult your ready-mix concrete producer for further information on methods and materials (retarders) to control the rate of hardening.

BEFORE PLACING

1. Concrete stiffens faster in hot weather—so have adequate work crews and equipment ready. This cuts down the total time between the start of placing and the application of curing materials.

2. Spray forms, reinforcing steel and subgrade with water periodically to keep them cool and to prevent absorption of water from the mix.

3. To minimize cracking and crazing of fresh concrete, plastic shrinkage and rubber sets—use lightweight sheeting to protect concrete against sun and drying winds.

DURING PLACING

4. Don't let trucks stand in the sun. Discharge concrete as soon as trucks arrive at the job site. Prolonged mixing in hot weather increases temperature of the concrete which shortens your placing and finishing time.

5. Notify your ready-mixed concrete producer of any delays in placing schedule so he can re-schedule your deliveries.

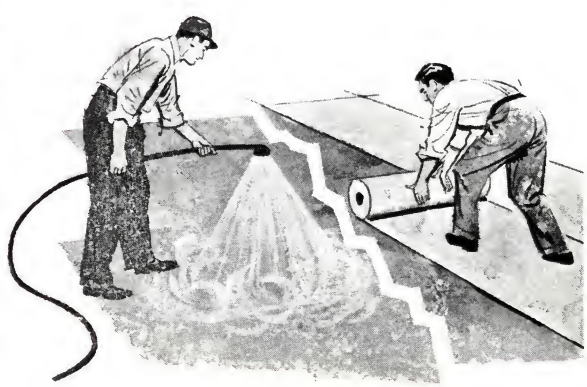
6. Vibrate and screed without delay. Don't over-vibrate or over-finish the surface. Don't use cement shakes as driers. Between screeding, floating and trowelling operations, protect the slab from rapid drying by covering with vaporproof sheeting.

AFTER PLACING

7. Cure *immediately* and *continuously* after finishing to prevent moisture evaporation from the concrete. Ponding, paper or other waterproof coverings, white pigmented or membrane curing compounds may be used.

8. At early age, spray outside of forms with water periodically for effective cooling and curing. Tops of walls, columns and other exposed vertical elements should be wet-cured and covered.

9. Test cylinders and beams must be covered immediately with damp burlap and kept at 60F to 80F to prevent serious strength reductions from exposure to sun and wind. After 24 hours, carefully move specimens to prescribed curing facilities and store until time of test.



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POZZOLITH AND LOW PERMEABILITY CONCRETE

THE PROBLEM: Ordinary portland cement concrete is permeable due to the network of capillary channels formed by the 15 to 20 gallons of "excess" mixing water that leave each cubic yard of concrete as it sets and hardens. This excess water was used only to obtain placeability and after placement this water is the cause of many concrete problems. The network of capillary channels formed in the hardened concrete becomes an avenue for the passage of water through the concrete. Alkali and acid ground waters penetrating the concrete react with the cement hydrate and cause disintegration; water freezing with the concrete also causes disintegration; moisture that gains access to reinforcing rods can cause corrosion and eventual disruption of the surface adjacent to the reinforcement.

TECHNICAL CONSIDERATIONS: The prime requirements for producing low permeability concrete are the use of high quality materials in a well proportioned mix of low water content, adequately mixed, properly placed, consolidated and cured.

- Concrete should be made with sound impervious aggregates. Proportioning of materials should be in accordance with recognized mix design methods (ACI 613 or equivalent).
- The use of a water reducing—air entraining—set controlling admixture aids in developing concretes with these essential qualities:

  1. A mix with low unit water content consistent with required placeability.

  2. An effective, discrete air-void system, reducing adverse capillarity and moisture transmission.

  3. Controlled rate of hardening to aid in elimination of cold joints.

  Also institute such other practices as are necessary to aid in the control of these qualities.
- Placing procedures should be restricted to those that preserve the homogeneous qualities of the concrete, minimizes honeycomb, laitence-seams, sand streaking, etc.
- Mechanical vibrators supplemented by hand spading serve to consolidate the mix and produce a dense homogeneous mass.
- It is important to make adequate provision for maintaining the proper temperature and presence of moisture required for proper curing . . . prevailing climatic conditions must be considered.

FUNCTION OF *POZZOLITH* IN PRODUCING LOW PERMEABILITY CONCRETE:

- Reduces mixing water up to 20% for required slump. At the same slump *Pozzolith* mixes are noticeably more workable, and cohesive.

- Entrains optimum air content and provides desired control of rate of hardening . . . normal, retarded or accelerated, to meet specific handling, placing and finishing requirements under given climatic conditions.
- Reduces settlement shrinkage and water gain under aggregate and under reinforcing steel for increased bond of concrete to reinforcing steel.
- Reduces drying shrinkage . . . minimizes cracking.

SUGGESTED SPECIFICATION CLAUSES:

An approved independent testing laboratory shall prepare the mix designs for the classes of concrete specified for use in the contract. The concretes shall be homogeneous, readily placeable and uniformly workable and shall be designed in accordance with ACI 613 employing *Pozzolith,* manufactured by The Master Builders Co., Cleveland, Ohio, to reduce total water content and to improve or control the specific qualities herein and elsewhere required as to (a) workability, (b) entrained air content, (c) rate of hardening (retarded, normal or accelerated, as the case may be), and (d) compressive and/or flexural strength.

Slump shall be the minimum required to secure proper placement and compaction of concrete.

Rate of placement shall be scheduled to eliminate cold joints.

Concrete shall be thoroughly consolidated with vibrators supplemented by hand spading as required.

Concrete shall be cured for a minimum of seven days; slabs shall be cured by ponding or with a membrane curing compound applied as soon after final troweling as application can be made without marring the finish; forms shall be protected from drying and shall not be stripped prior to seven days after casting unless a membrane curing compound is applied immediately after removal of forms.

POZZOLITH IN INTEGRALLY COLORED CONCRETE

TECHNICAL CONSIDERATIONS:

Integral coloring of concrete is practical for lighter tints in thin sections, but due to the quantity of pigment required it is an expensive method for deeper tones and thick sections. Alkali soils, bright sun, and rapid evaporation also introduce technical problems in connection with satisfactory colored concrete, particularly patio slabs and walks.

DESIGN OF INTEGRALLY COLORED CONCRETE MIXES:

1. For uniform color tone, the same mix design, slump, and brand of cement must be used.

2. Select an inorganic pigment with a good record of local performance. Accurately weigh the pigment for each batch.

3. Design mix for the strength required; select a slump and sand aggregate ratio that permits easy consolidation to avoid segregation of pigment through overworking of mix.

.. Use a water-reducing, plasticizing admixture to reduce shrinkage cracks and assist in placement of the mix. Use an admixture with dispersing qualities to help maintain uniform distribution of the pigment.

FUNCTION OF *POZZOLITH* IN INTEGRALLY COLORED CONCRETE:

Pozzolith as recommended by the local Master Builders field man reduces the water required for the slump specified, from 10 to 15%, disperses the cement and pigment particles uniformly, increases the plasticity to assist in placement and finishing, and increases cohesion to prevent segregation. In exposed slabs, *Pozzolith* helps keep the surface moist for a longer period, reducing the chances of surface checks and plastic shrinkage cracks. For ordinary colored slab concrete, a 4.5 or 5 sack mix with *Pozzolith* produces excellent results.

SPECIFICATION CLAUSE FOR INTEGRALLY COLORED CONCRETE:

Colored Concrete as indicated on plans shall be designed for the strength required using *Pozzolith* as recommended by the Master Builders Company field man. Pigment shall be an inorganic manufactured product with a record of satisfactory local performance as to consistency of color and durability. Pigment shall be accurately weighed for each batch. Concrete shall be designed to provide good cohesion and easy placement at 5" to 6" slump without excessive working required for consolidation in forms, and without segregation in handling. Mixing water may be added to compensate for loss of slump due to evaporation in the course of mixing and placement.

NOTE: Master Builders *Colormix* contains exclusive water-reducing and dispersing agents and when *Colormix* is employed, *Pozzolith* need not be used.

POZZOLITH IN TILT-UP SLABS, LIFT SLABS OR SLABS POURED OVER MEMBRANE

TECHNICAL CONSIDERATIONS:

Plastic shrinkage cracks usually occur in slabs of these types due to evaporation of surface moisture exceeding the rate of rise of water to the surface. Drying shrinkage stresses are created while the concrete has little or no tensile strength. Base slab and reinforcing steel exposed to the sun may reach temperatures of 140° F., causing flash set and rapid drying of the concrete in contact with them. Water cannot escape from the bottom of the concrete and the additional water retained in the slab increases shrinkage potential.

RECOMMENDED PRACTICE:

Wind breaks, sun shades, and fogging are recommended to minimize heating of base slabs and steel, and rapid evaporation. However, such measures involve additional expense and are often impractical under actual job conditions. Where acceleration of set due to heat is the only problem, retarding admixtures are effective. Under rapid drying conditions, on the other hand, retarders delay development of tensile strength and may increase early cracking. Application of a membrane curing compound immediately after final finishing is essential to prevent drying shrinkage cracks after hardening.

FUNCTION OF *POZZOLITH*:

Cracks due to drying shrinkage either before or after hardening are eliminated or minimized in concrete containing *Pozzolith* 3 formulations. Reduction of 10% to 20% in water requirement reduces shrinkage potential. Early tensile strengths are developed before shrinkage stresses reach values that produce cracking. Mixes can be designed with *Pozzolith* 3 formulations for the addition of evaporation water to compensate for early drying without increasing shrinkage potential and for better diffusion of the heat of the base slab and reinforcing steel, greatly reducing the tendency to crack over steel near the surface.

SUGGESTED SPECIFICATION FOR CONCRETE SLABS:

All concrete for slabs shall be designed for the strength specified using *Pozzolith* as recommended by The Master Builders Company of Cleveland, Ohio. Mix shall be designed for placement at five-inch slump; to compensate for excessive evaporation of water in transit and immediately after placement, evaporation water in excess of the maximum allowable under the design may be added when necessary in accordance with the following guide:

One gallon of water per cubic yard of concrete for each 10 degrees in excess of 75° Fahrenheit.

One gallon of water per cubic yard of concrete for each 5 m.p.h. of wind velocity in excess of 5 m.p.h.

Should conditions require more than 5 gallons of additional water per cubic yard as computed from the above table, slab concrete shall be protected from wind and sun by means of wind and sun shades.

Membrane curing compound shall be applied to all slabs as soon after final finishing as application can be made without marring the surface.

POZZOLITH IN PUMPED GROUT FOR MASONRY

TECHNICAL CONSIDERATIONS:

Special design of masonry grout mixes improves the quality of the grout in place and greatly facilitates placement, particularly in the case of pumped grout where lubrication, cohesion, and absence of segregation are required to prevent plugging of the line. Settlement shrinkage, permeability, and cracking can be greatly reduced by proper use of admixtures in the mix design and by proper handling.

DESIGN AND PLACEMENT OF PUMPED GROUT MIX:

1. Hold top size of coarse aggregate to 15% to 25% of the inside diameter of the grout line, using the lower percentages for harsh aggregates or for longer lines.

2. Use 30% to 40% pea gravel with well graded *concrete* sand.

3. Design mix with *Pozzolith* to produce 4% to 6% entrained air. Use retarding *Pozzolith* for higher ambient temperature to retard set, to allow more time for placement, and to prevent cold joints.

4. Prime the line with a slurry of cement and water just prior to each operation. Estimate volume of slurry required on the basis of 1 gallon for each 100 sq. ft. of inside pipe area or about ½ gallon for each 100 lineal feet of 2″ line.

5. For proper filling of block cells and other areas of narrow cross section, slumps of 6 to 10 inches are normally used. With the use of *Pozzolith* these slumps are attained with the water requirement that normally produces a 3- to 5″ slump in plain mixes.

FUNCTION OF *POZZOLITH* IN PUMPED GROUT:

Pozzolith provides more uniform feed of grout from the hopper of the machine, lubricates the line, and facilitates consolidation in the masonry wall. *Pozzolith* reduces the water required for a given slump 10 to 15%

below the corresponding plain mix, providing extra strength at equal cement factor.

SPECIFICATION CLAUSE FOR GROUT MIXES:

Grout for block and brick wall shall be designed for the strength indicated on plans, using *Pozzolith* as recommended by Master Builders Company of Cleveland, Ohio, and adjusted by their concrete technician to contain 4 to 6% entrained air. Mix shall be designed for a 6 inch slump; additional water may be used to compensate for loss of slump due to evaporation during mixing and placement.

POZZOLITH IN SLICK-LINE CONCRETE

(Pumped or Pneumatically Placed)

TECHNICAL CONSIDERATIONS:

The same factor of limited access that makes pumping, air slugging, or blowing of concrete into forms necessary, in most cases hampers the consolidation of the concrete in the forms by vibrators or other common methods. If these special conditions are recognized in the design of the mix, plugging of lines, honeycomb, and other difficulties may be avoided.

MIX DESIGN AND PLACEMENT PROCEDURE:

1. Hold top size of coarse aggregate to 15% to 25% of the inside diameter of the line, using the lower values for longer lines and harsh aggregates.

2. Design mix with higher sand aggregate ratio than used in a corresponding mix for normal placement, to permit easier consolidation in forms.

3. Use a lubricating water-reducing admixture that will produce 4% to 5% entrained-air concrete in the forms. A retarding admixture, meeting the other requirements, will provide adequate time for placement without cold joints, and will prevent fast setting in event of breakdown.

4. Design mix for a 4- to 6-inch slump at the forms, recognizing there is generally a loss of slump between pump or blower and the forms.

5. Prime lines with a cement and water slurry immediately preceding each placement to prevent loss of paste from the concrete. A mixture of 8 gallons of water and one sack of cement is sufficient for 900′ of 6″ line.

6. Quality control tests should be based on the concrete as it is delivered into the forms.

FUNCTION OF *POZZOLITH* IN PUMPED OR PNEUMATICALLY PLACED CONCRETE:

Pozzolith greatly aids pumping or slugging, by providing more consistent feeding of concrete from the hopper, by lubricating the line, and facilitating reconsolidation in the forms. A retarding *Pozzolith* will maintain the plasticity of the concrete one to three hours longer, preventing fast set in the line in the event of a breakdown. Adjustment of air-entrainment and mix proportions under job conditions is highly important; an experienced Master Builders concrete technician is available without charge to make recommendations and adjustments on the job.

SPECIFICATION CLAUSE FOR PUMPED OR PNEUMATICALLY PLACED CONCRETE

Where concrete is to be placed using a pump or blower, a special mix shall be designed using *Pozzolith* as recommended by the Master Builders field man. Mix shall be designed for deposit in the forms at 4- to 6-inch slump and shall be designed with adequate sand and 4% to 5% entrained air to permit easy consolidation in forms. Where loss of slump between mixer and forms is established, additional water above the designed water may be added to compensate for the loss in slump.

POZZOLITH AND MASS CONCRETE

TECHNICAL CONSIDERATIONS:

The special characteristics of mass concrete are present in any concrete pour of large volume and cross section in relation to surface area, including dams, large footings, base blocks for heavy equipment or similar units. The special problem is cracking due to volume changes which, assuming suitable aggregates, results primarily from thermal volume change, surface drying shrinkage and ambient temperature. Thermal volume change is affected by the temperature rise of the concrete caused by hydration of the cement. Heat of hydration varies with the cement factor for each type of cement. Drying shrinkage varies with the amount of mixing water. Control of the placing temperature and temperature rise such that the final temperature of the concrete is close to the mean ambient temperature is the desired goal in control of cracking in mass concrete. Thus, for minimum cracking from volume change, it is necessary to use the lowest water and cement content that will produce the required strength, placeability, impermeability and durability and use the proper placing temperature.

Permeability is a consideration in all dams; other factors in mass concrete may be freeze and thaw durability and the resistance to penetration of other disintegrating materials.

FEATURES OF MIX DESIGN:

Low volume change through minimum water and cement content is obtained by using:

1. Largest size aggregate.
2. Minimum mortar content.
3. Water-reducing air-entraining admixture.

Low Permeability is obtained through:

1. Low unit water content.
2. Low water-cement ratio.
3. Three to six percent entrained air by volume.
4. Cohesive mix.
5. Thorough compaction.
6. Thorough curing.

FUNCTION OF *POZZOLITH* IN MASS CONCRETE:

Pozzolith 8 and *Pozzolith* Low Heat are water-reducing and retarding agents which can be adjusted to produce the percentage of entrained air required for the job. *Pozzolith* is a valuable tool in the design of mass concrete due to the following properties:

1. Ten to fifteen percent less water for a specified slump.
2. Lower cement requirement for specified strength.
3. Entrained air as required for workability and increased permeability.
4. Easier placement and greater cohesion of concrete.
5. Retardation during first 12 hours after mixing lowers the peak of the heat evolution curve, reducing volume change for a given cement factor, and also reduces the danger of cold joints.

ADMIXTURE SPECIFICATION FOR MASS CONCRETE:

Mass concrete, as indicated on plans, shall be designed for the specified strength in accordance with the water-cement ratio law using *Pozzolith* 8 or *Pozzolith* Low Heat as recommended by The Master Builders Company. The air content shall be adjusted to three to six percent.

POZZOLITH AND PRESTRESSED CONCRETE

TECHNICAL CONSIDERATIONS:

Compressive strengths of 5,000 p.s.i to 6,000 p.s.i. are generally required and, for economy in time and re-use of forms, high strengths at early

ages are desirable. A high degree of uniformity in all qualities of the concrete is an essential for each individual job, in order that differentials in shrinkage and deflection will be minimized throughout the job. High quality materials are necessary and should be pretested to determine their uniformity, soundness and properties in relation to strengths, modulus of elasticity, shrinkage, and creep. Calcium chloride is generally prohibited due to the hazard of progressive corrosion of stressed steel by the chloride ion. High early cement provides a saving in time required to attain a given strength but introduces the hazard of flash setting in the low slump rich mixes and is sometimes not permitted where durability is a consideration.

MIX DESIGN DATA:

	Plain Concrete	*Pozzolith 8 Concrete*
Normal Curing	7 day — 3000-3500#	7 day — 3800-4300#
	28 day — 4800-5300#	28 day — 6000-6500#
Steam Curing	24 hours — 2900-3300#	24 hours — 3800-4300#

FUNCTION OF *POZZOLITH* IN PRESTRESSED CONCRETE MIXES:

Pozzolith 8 Improved (which contains no chloride) reduces mixing water required for a given slump 10% to 15%, thereby reducing drying shrinkage and increasing strengths. *Pozzolith 8 Improved* plasticizes the mix permitting easier consolidation of concrete in sharp angles and around closely spaced reinforcement, reducing the chance of honeycomb or other gross defects.

SPECIFICATION OF PRESTRESSED CONCRETE:

Concrete for prestressed units shall be designed for the required strength using *Pozzolith 8 Improved* as recommended by The Master Builders Company of Cleveland, Ohio. Cement shall be Type I or Type II; Type III may be used on written permission of engineer. No material containing chloride shall be used in the concrete. Aggregates shall be tested for soundness, absorption, and volume change to determine acceptability; and aggregates shall be maintained within 0.20 fineness modulus for the job. Mix shall be designed with adequate fine aggregate to permit easy consolidation under vibration at two to three-inch slump. Concrete shall be cured for a minimum of seven days if normal curing is used. If concrete is steam cured the following cycle shall be used: After casting, temperature around prestressed unit shall not exceed 100° F. until initial set occurs; after final set, temperature shall be increased gradually at a maximum rate of 30 degrees per hour to an absolute maximum of 165° F. When ambient temperatures are below 50° F. unit shall be pre-cooled to 100° F. before exposure to ambient temperatures.

POZZOLITH AND PLASTIC SHRINKAGE CONTROL

Technical Considerations

Plastic shrinkage cracks are common in concrete slabs due to the high rate of evaporation of water from the surface of concrete. Loss of water at any age induces stresses in concrete and results in cracks if the stresses exceed the tensile strength. In the plastic state concrete has little or no tensile strength and the stresses caused by water evaporation result in cracks before finishing operations are completed or shortly thereafter. Cracking also occurs over reinforcing bars near the surface of concrete particularly when low slump concrete is placed around sun heated bars.

Recommended Practice

Wind breaks, sun shades or fogging of the surface should be required. Realistic slumps should be used recognizing the loss in water which will take place due to temperature and evaporation caused by low humidity and/or wind velocity. When ground absorption cannot be eliminated, it should be considered in determining allowable slump. To minimize heat of hydration, cement contents should be no greater than are required to produce specified strengths. Fine aggregate contents should also be held to the minimum which will produce a workable mix with satisfactory compacting properties.

Function of *Pozzolith*

Cracks due to drying shrinkage either before or after hardening are eliminated or minimized in concrete containing *Pozzolith* 3 formulations. Reduction of 10% to 20% in water requirement reduces shrinkage potential. Early tensile strengths are developed before shrinkage stresses reach values that produce cracking. Mixes can be designed with *Pozzolith* 3 formulations for the addition of evaporation water to compensate for early drying without increasing shrinkage potential and for better diffusion of the heat of the base slab and reinforcing steel, greatly reducing the tendency to crack over steel near the surface.

Suggested Specification for Concrete Slabs

All concrete for slabs shall be designed for the strength specified using *Pozzolith* as recommended by the Master Builders Company. Mix shall be designed for placement at five-inch slump; to compensate for excessive evaporation of water in transit and immediately after placement, evaporation water in excess of the maximum allowable under the design may be added when necessary in accordance with the following guide:

One gallon of water per cubic yard of concrete for each 10 degrees in excess of 75° Fahrenheit.

One gallon of water per cubic yard of concrete for each 5 m.p.h. of wind velocity in excess of 5 m.p.h.

Should conditions require more than 5 gallons of additional water per cubic yard as computed from the above table, slab shall be protected from wind and sun by means of wind breaks and sun shades.

Membrane curing compound shall be applied to all slabs as soon after final finishing as application can be made without marring the surface.

POZZOLITH AND THIN SHELL CONCRETE

TECHNICAL CONSIDERATIONS:

Close control of concrete mix proportions and setting time are of great importance in thin shell concrete, whether hyperbolic paraboloid, barrel, folded plate, dome or other types, due to the following special features of these structures:

1. Average thickness of two to three inches makes good workability and cohesion essential.
2. Steep slopes of formwork require placement of concrete at low slump to eliminate sagging.
3. Placement and finishing operations are largely manual, requiring more time for completion, particularly where stripping and floating of the marginal beams to dress out the radii is a part of the operation.
4. Low water content of the mix, thin sections, and exposure to weather increase the chances of plastic shrinkage cracks during finishing operations, due to rapid evaporation of the water from the exposed surfaces.
5. High early strengths are frequently desirable for early stripping and re-use of forms.
6. Thinness of sections makes it necessary to employ good curing immediately after final finishing operation to retain water for hydration and to prevent excessive drying shrinkage stresses while concrete is still "green." If the shell is to receive a decorative paint treatment or a plastic coating it should be water cured with damp burlap and moisture-proof paper sealed at the edges. The use of a membrane curing compound may impair the bond of the decorative treatment.

FUNCTION OF *POZZOLITH* IN THIN SHELL CONCRETE:

1. *Pozzolith* greatly increases plasticity and cohesion, facilitating placement and finishing at the low slumps used.
2. Setting time can be adjusted to meet the job requirements by selection of the proper *Pozzolith* formulation by the Master Builders Field man.
3. *Pozzolith* reduces plastic shrinkage cracking. Under severe evaporative conditions introduced by high winds and low humidity, facilities for applying a fog or fine spray of water to the surface between finishing operations should be provided to prevent formation of cracks in the plastic concrete.
4. *Pozzolith* increases the three to seven day strengths 35% to 50% above those obtained with a plain mix of the same slump and cement content, permitting earlier stripping and re-use of forms.

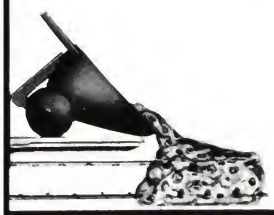
SUGGESTED SPECIFICATION OF THIN SHELL CONCRETE MIX:

Concrete shall be designed for the specified strength, using *Pozzolith* of the type recommended by the Master Builders Company Field man to provide the setting time required by job placement conditions. Immediately after final finishing concrete shall be properly cured with water, damp burlap and moisture-proof paper sealed at the edges (or with Master Builders *Masterkure,* if a decorative after-treatment is not to be applied). Contractor shall notify the nearest office of the Master Builders Company at least 72 hours in advance of the initial pour in order that a Master Builders Field man may be present to assist in any necessary adjustment of the concrete mix.

DO'S . . . concrete placing DON'TS

U.S. Bureau of Reclamation Recommended Practices

PLACING SLAB CONCRETE FROM BUGGIES

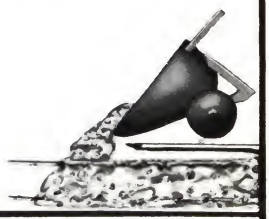


CORRECT

Dump concrete into face of concrete in place.

INCORRECT

To dump concrete away from concrete in place.



PLACING CONCRETE IN TOP OF NARROW FORM

CORRECT

Discharge concrete into light hopper feeding into light flexible drop chute. Separation is avoided. Forms and steel are clean until concrete covers them.

INCORRECT

To permit concrete from chute or buggy to strike against form and ricochet on bars and form faces, causing separation and honeycomb at the bottom.

PLACING IN DEEP NARROW WALL THROUGH PORT

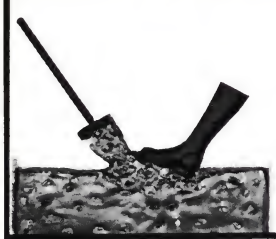
CORRECT

Drop concrete vertically into outside pocket under each form opening so as to let concrete stop and flow easily over into form without separation.

INCORRECT

To permit high velocity stream of concrete to enter form on an angle from the vertical. This invariably results in separation.

TREATMENT OF ROCK POCKET

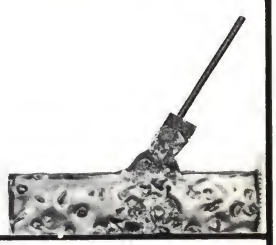


CORRECT

Shovel rocks from rock pocket onto softer, amply-sanded area and tramp or vibrate.

INCORRECT

Attempting to correct rock pocket by shoveling mortar and soft concrete onto it.



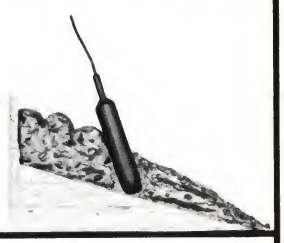
WHEN CONCRETE MUST BE PLACED IN A SLOPING LIFT

CORRECT

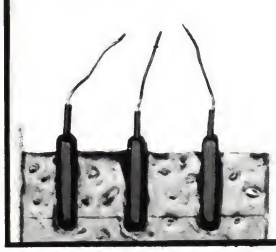
Start placing at bottom of slope so that compaction is increased by weight of newly added concrete. Vibration consolidates.

INCORRECT

To begin placing at top of slope. Upper concrete tends to pull apart, especially when vibrated below, as vibration starts flow and removes support from concrete above.



SYSTEMATIC VIBRATION OF EACH NEW LIFT

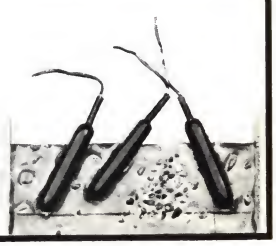


CORRECT

Vertical penetration of vibrator a few inches into previous lift (which should not yet be rigid) at systematic regular intervals found to give adequate consolidation.

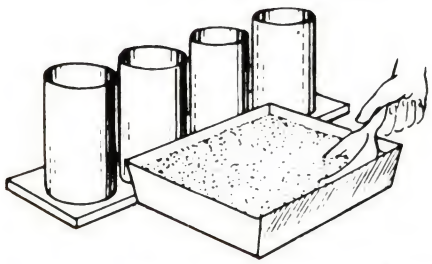
INCORRECT

Haphazard random penetration of the vibrator at all angles and spacings without sufficient depth to assure monolithic combination of the two layers.



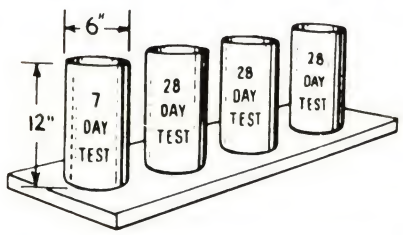
. . . cylinder casting MUSTS

NOTE: For complete procedure, see ASTM C 31-55, C 94-55T, and C 172-54.



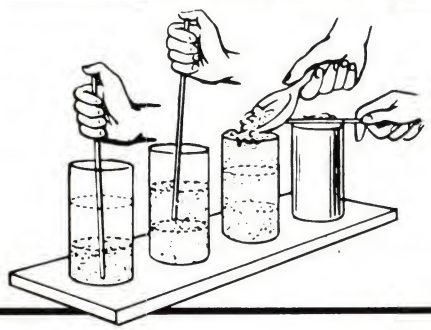
TAKE 3 PART SAMPLE

A sample should be obtained from at least 3 parts of the load, taken directly from the truck or mixer discharge. Samples should not be taken at the beginning or end of discharge from truck. Before filling the molds, the individual portions of the sample should be remixed with a shovel the minimum amount to ensure uniformity, in a large flat pan or on a clean non-absorptive surface.



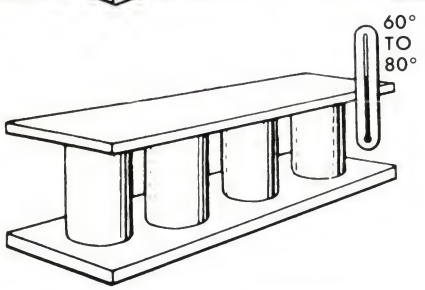
USE ONLY NON-ABSORPTIVE MOLDS

Steel, or paraffin-treated paper molds, 6″ in diameter by 12″ long are usually used for casting concrete cylinders in the field. Before filling, they should be placed on a smooth, firm, level surface. Three cylinders should be made for the 28-day test.



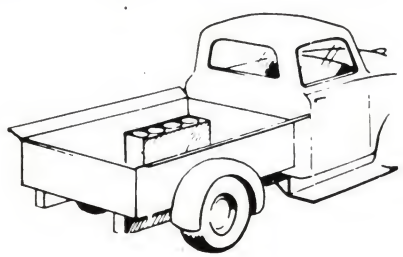
FILL MOLDS IN 3 LAYERS AND ROD EACH LAYER 25 TIMES

Molds should be filled in 3 equal layers, and each layer rodded uniformly 25 times with ⅝″ bullet pointed rod. When rodding upper layers, the rod should just break through into the layer underneath. All molds should be filled uniformly—that is, place and rod the bottom layer in all, then the 2nd layer, etc. The 3rd layer should contain an excess which can be struck off smooth and level after rodding.



LET CYLINDERS SET 24 HOURS AT TEMPERATURE BETWEEN 60° AND 80° F.

Cylinders should be left undisturbed for 24 hours after casting, to ensure that they have set enough to withstand handling. Tops should be covered during this period to prevent loss of moisture and the temperature should be maintained between 60° and 80° F. Cylinders left on the job for several days at higher or lower temperatures will give non-standard and erratic results.



CURE AND HANDLE CYLINDERS WITH CARE

After hardening, cylinders should be placed in moist curing at 65° to 75° F. or sent to a laboratory for standard curing. Careful handling is still necessary since cylinders which are allowed to rattle around in a box, or the back of a car or pick-up, can suffer considerable damage.

144B

MB-VR

Air-Entraining Agent for Concrete

DESCRIPTION:

MB-VR is a neutralized Vinsol Resin type air-entraining agent for concrete. It is furnished in a water solution form and is ready to use as it comes from the drum. *MB-VR* is compatible for use with other admixtures commonly used in concrete, however, if more than one admixture is being used, each should be dispensed into the mix separately.

MB-VR meets requirements of ASTM C-260; AASHO M-154; CRD-C-13 and other Federal and State specifications for air-entraining agents for concrete.

WHERE USED:

Used as an air-entraining agent to produce air-entrained concrete. Air-entrained concrete is widely recognized for its resistance to freezing and thawing, scaling due to the use of de-icing salts and other factors of severe exposure. It is used to impart improved workability to lean, harsh mixes.

The use of *MB-VR* and Master Builders *Pozzolith* is a desirable combination for producing concrete of highest structural quality in normal as well as lightweight concrete.
lightweight concrete.

ADVANTAGES OF MB-VR:

1. The entrainment of 4% to 6% air in the concrete mix results in the following improvements in concrete qualities:

a. Increased resistance to freezing and thawing.
b. Increased resistance to scaling from de-icing salts.
c. Improved plasticity and workability.
d. Reduced segregation and bleeding.
e. Reduced permeability.

NOTE: The use of *Pozzolith* supplemented with *MB-VR* will produce results superior to those mentioned above as obtained by the use of a vinsol resin type air-entraining agent.

2. Low Cost. Ready-to-use.

3. Permits close control of entrained air in concrete.

4. Easy to use. Can be introduced into the concrete with conventional automatic dispensers designed for simple air-entraining agents or by hand with a suitable measuring device.

5. Compatible for use in concrete containing other admixtures; water-reducers, accelerators, retarders, densifiers and water repellents, and to increase entrained air content of concrete mixes made with air-entraining portland cement.

STANDARD SPECIFICATION:

The air-entraining agent shall be *MB-VR* which is a neutralized Vinsol

resin solution conforming to ASTM C260, AASHO M-154, and CRD-C-13. It shall be dispensed separately into the concrete mix in an amount required to attain the specified quantity of entrained air in the finished concrete, the contribution toward enhancement of entrained air by cement, aggregates, and other ingredients being taken into consideration.

ESTIMATING DATA:

Without *Pozzolith,* use ½ ounce to 1 ounce per bag of cement depending on the amount of air entrainment desired (usually 4% to 6%). In mixes containing *Pozzolith,* less than half the normal amount of air-entraining agent will usually be needed. The exact quantity of air-entraining agent needed for a given air content of concrete is not constant because of variations in concrete making materials from different sources.

PACKAGING:

5 gallon steel pails and 55 gallon steel drums only.

FREIGHT CLASSIFICATION:

Rasin, in bulk, in drums.

STANDARD SPECIFICATION:

(Insert specification to cover. Should this type of material be covered with a suggested specification?)

DIRECTIONS:

Use *MB-VR* solution as it comes from the drum. Do not dilute or mix with solution of any other admixture. If other admixtures are used, dispense them separately into the concrete mix. *MB-VR* may be used with conventional automatic dispensers designed for simple air-entraining agents, or by hand with a suitable measuring device. The use of ½ ounce to 1 ounce of solution per bag of cement is usually adequate to provide 4% to 6% entrained air in concrete made with Type I cement. Mixes made with *Pozzolith* will usually require about half of this amount of *MB-VR.* The exact quantity of air-entraining agent needed for a given air content is not constant because of variations in concrete making materials from different sources. Increase or decrease the quantity of solution as required to obtain the desired air content.

PRECAUTIONS:

1. Do not dilute and do not mix with solutions of other admixtures. If more than one admixture is used, dispense each one separately into the mix.
2. Freezing does not harm *MB-VR.* If solution has been frozen, it should be restored to room temperature (about 70° F.) and thoroughly mixed to insure that the solution is homogeneous.
3. Consistency varies somewhat with temperature. When possible, it is recommended that the solution be used in a range of 70° F to 80° F to maintain a more free-flowing solution.

RELATED PRODUCTS:

POZZOLITH*—Water-reducing and set-controlling agent for concrete.
MASTERKURE*—Membrane Curing Compound.

STEAROX "100"

An Integral Water-Repellent for Concrete and Mortar

DESCRIPTION:

*Stearox** "100" is a soft white powder of 100% stearic acid, atomized to mix readily with the batching water. It contains no adulterants, fillers or other compounds. *Stearox* "100" imparts water-repellency while preserving the full strength of the concrete.

WHERE USED:

In floor slabs laid on the ground, brick mortar, portland cement stucco, cement plaster and all types of concrete products.

ADVANTAGES OF *STEAROX* "100":

1. Reduces relative absorption 60%.

2. Higher concentration reduces handling, shipping and storage charges. Only 1/10 the amount of *Stearox* "100" is required to give the same stearate content as most of the other commercial powders.

3. Preserves strength—design strengths are secured with *Stearox* "100", since it is not diluted with other materials that weaken concrete.

4. *Stearox* "100" is easily converted to a paste on the job. It can be added as a dry powder, or in paste form, whichever is more convenient for the batching operation.

	1 hr.	1 day	Relative Absorption
Plain 1:3 Mortar	.9%	1.5%	100
Average of 6 brands of powder (2 lbs. per bag of portland cement)	.7%	1.1%	74
Stearox "100" (0.2 lb. per bag of portland cement)	.3%	.6%	40

ESTIMATING DATA:

Use 0.2 lb. of *Stearox* "100" per bag of portland cement. For a higher degree of water-repellency, add 0.25 to 0.35 lb. of *Stearox* "100" per bag of portland cement.

PACKAGING:

50 lb. and 10 lb. paper bags.

FREIGHT CLASSIFICATION:

Cement Compound, Building or Floor, Dry.

STANDARD SPECIFICATION:

All concrete for floor slabs laid on the ground shall be treated with *Stearox "100"*, using not less than 0.2 lb. per bag of portland cement, in

**Registered trademark.*

strict accordance with the directions of the manufacturer, The Master Builders Company.

DIRECTIONS:

Add to the batching or gauging water in proportion of 0.2 lb. per bag of portland cement. A measuring scoop can be made at the job site to hold the correct amount for one-bag, five-bag, etc., mixes.

Stearox "100" can be converted to a paste on the job to facilitate batching. In mixing, the water should be stirred into the *Stearox. Do not add the* Stearox *to the water.*

PRECAUTIONS:

1. Urge contractors to have bidders submit in writing the stearic acid content of their powder.

2. In converting *Stearox* "100" to paste, add water to *Stearox,* not *Stearox* to water.

RELATED PRODUCTS:

***POZZOLITH*—**Water-reducing admixture for concrete.

MASTERKURE*—Membrane curing compound.

OMICRON MORTARPROOFING*— Water-reducing admixture for masonry mortar.

**Registered trademark.*

INTEGRAL TREATMENT FOR MASONRY MORTAR

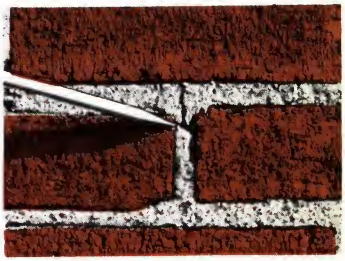
INTRODUCTION

Mortar shrinkage is one of the principal causes of leaky brickwork. Control of shrinkage is, therefore, an essential step in obtaining watertight masonry.

*Omicron Mortarproofing**, Master Builders' integral treatment for masonry mortar, is designed to produce tight brick walls by preventing mortar shrinkage. In addition, it is designed to improve the overall properties of mortar, thus permitting better workmanship, enhancing appearance and increasing durability.

SEPARATION CRACKS

Separation cracks result from incomplete bond caused by lack of water retentivity due to bleeding of mortar or a loss of plasticity, either by evaporation or through absorption by brick.

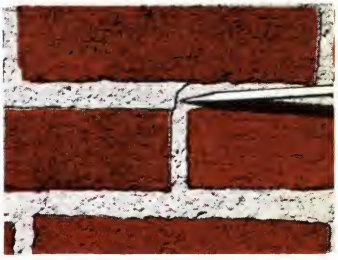


AT JUNCTURE OF JOINTS

Leakage frequently occurs at junctures of joints. Openings in the mortar at these points are the result of other types of cracks, unfilled vertical joints, and settling of the mortar.

INITIAL SHRINKAGE CRACKS

All plain mortars shrink. When the excess water used to produce workability leaves, it causes shrinkage while the bond between brick and mortar is still weak. This often causes leaks.



VOLUME CHANGE CRACKS

When subjected to wetting and drying, hardened mortars expand and contract. Stresses created by this action tend to crack mortar joints and widen cracks by initial shrinkage.

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BRICK AND MORTAR SELECTION GUIDE

Exposures vary considerably for different types of construction and in different areas, and these factors should be considered in selecting the brick and designing the mortar.

ASTM C-62, "Specification for Clay Building Brick", divides bricks into three exposure classes: (1) Severe Weathering, (2) Moderate Weathering, (3) No Weathering.

Mortar is similarly classified according to exposure, although ASTM C-270 appears to classify the different mortars according to strength. In general, strength of mortar is often indicative of other properties, and may be explained as follows:

TYPE A MORTAR is high-strength mortar (2500 psi at 28 days†). It is suitable for general use, for reinforced brick masonry and plain masonry below grade. High water retentivity, good plasticity and workability are required.

TYPE B MORTAR is medium-strength mortar (750 psi at 28 days†) for general use in exposed masonry above grade, for parapet walls, exposed masonry chimneys and exterior walls subjected to severe exposure.

TYPE C MORTAR is low-strength mortar (350 psi at 28 days†) for non-load bearing walls of solid masonry units . . . and for load bearing walls of solid units in which compressive stresses do not exceed 100 psi and where exposures are not severe such that the masonry will not be subjected to freezing and thawing in the presence of moisture. Type C mortar should not be used in construction where high lateral strength is required.

†*Compressive strength—average of three 2-inch cubes of mortar.*

MORTAR PROPORTIONS BY VOLUME*

Mortar Type	Cement	Hydrated Lime or Lime Putty	Sand
A	1	¼	3
B	1	1	6
C	1	2	9

*Portland Cement: 94 lbs. (1 cu. ft.); Hydrated Lime: 40 lbs. (1 cu ft.); Lime Putty: 40 lbs. (1 cu. ft. of dry lime solids); Sand—damp and loose: 80 lbs. (1 cu. ft. of dry sand).

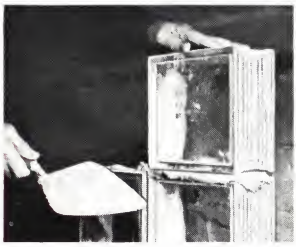
OMICRON MORTARPROOFING

For Tight Brick Walls

DESCRIPTION:

Omicron Mortarproofing (OM*),* is a water-reducing plasticizing admixture for masonry mortar, containing a stearate-type water repellent. Added in dry powder form to the mortar at the mixer, *OM* produces better workability with 15% to 20% less mixing water—resulting in a substantial reduction in drying shrinkage, increased bond strength and reduced permeability and absorption. The cumulative effect of water reduction, water repellency and air entrainment results in a mortar of great durability.

Note: A modified formulation of *OM* is available for use with those brands of masonry cement which have water retentivity qualities. This product is known as *OMX* and its use with these cements results in performance similar to that of *OM*.



Tight walls are especially important in glass block construction because there is no "back-up".

WHERE USED:

In all masonry mortars, whether job-mixed cement-lime, masonry cement, or prepared masonry mortars. For laying up brick, tile, stone and glass block units and for portland cement stucco. *OM* is recommended for colored mortar—mortar produced with high-grade mortar colors like those ordinarily stocked by building supply dealers.

EXCESS WATER—PRIME CAUSE OF CRACKS:

Mortar shrinkage is one of the principal causes of leaky brickwork. The prime cause of openings in mortar joints is "excess" water in the mortar.

Chemically, only about 2 gallons of water are required to hydrate each bag of portland cement in a mortar mix. The balance of water used is to produce workability—3 to 4 gallons per bag in conventional mixes.

During the first 48 hours, much of this workability water is lost, causing the mortar to shrink. Since bond between mortar and brick is weak during this period, shrinkage frequently results in cracks, and subsequently in leaky brickwork.

ADVANTAGES OF OM:

1. OM CONTROLS MORTAR SHRINKAGE: *OM* produces ideal workability with 15% to 20% less mixing water, or 25% to 30% less "workability" water. This reduces initial shrinkage 30% to 40%, or generally below the point at which bond is broken (see chart).

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MIX	Shrinkage In Inches			Bond Strength 28 days (p.s.i.)
	24 hrs.	7 days	28 days	
1:1:6	.027	.030	.030	66.8
1:1:6 with "OM"	**.017**	**.019**	**.020**	**72.7**
1:2:9	.022	.024	.023	73.0
1:2:9 with "OM"	**.018**	**.014**	**.015**	**90.8**
Average of three 2"x4" cylinders				

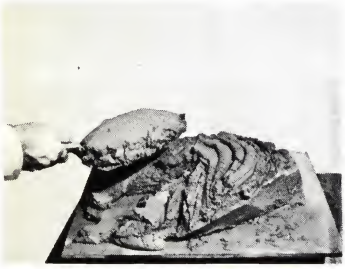
2. INCREASED BOND STRENGTH: *OM* increases bond strength 15%, as shown in the table. Studies by the National Bureau of Standards and other authorities show that with high bond, volume changes (resulting from wetting and drying of mortar causing it alternately to expand and contract) do not destroy the bond either in vertical or horizontal joints. Good bond, therefore, is essential.

3. MINIMUM BLEEDING: Mortars that bleed readily produce a plane of water on the horizontal surface that precludes proper bond formation with the brick. *OM* produces a workable mortar with an absolute minimum of bleeding. Tests by government agencies show that the basic ingredient of *OM* is the most effective material for control of bleeding in mortar.

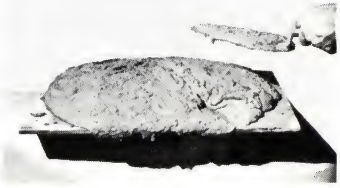
4. REDUCED POROSITY AND ABSORPTION: *OM* lowers porosity and reduces absorption 40% or more.

5. INCREASED WATER RETENTIVITY: By increasing water retentivity, *OM* minimizes the need for retempering and for reducing the loss of water by absorption in the brick.

6. FASTER, BETTER QUALITY WORK: *OM* produces a "fat", cohesive mortar which is easier to handle, which clings well to the trowel, and which retains its plasticity longer. Thus, better quality work can be done in less time.



OM added, water reduced 15% to 20%. Mortar has the right consistency for easy handling.



OM added, water not reduced. Mortar is soupy, cannot be handled. Proof that OM insures positive water reduction.

OMICRON MORTARPROOFING

7. LONG-TERM SAVINGS: When *OM* is used, maintenance costs are sharply reduced.

8. IMPROVED MORTAR FOR GLASS BLOCK: Mortar containing *OM* holds glass block in place, since reduced bleeding overcomes sliding. *OM* mortar bonds well to the blocks. It develops strength rapidly; and this, plus reduced shrinkage, preserves the mortar bond. *OM* is recommended by leading glass block manufacturers.

9. A "MUST" FOR STUCCO: In portland cement stucco, *OM* produces better workability and reduces shrinkage to minimize cracking.

ESTIMATING DATA:

Use 1 lb. of *OM* per bag of portland cement or masonry cement, and 1 lb. per cubic foot of lime (hydrated or lime putty) in the mix. 1000 brick with ½" joints require 2/3 cu. yd. of mortar or approximately 6 cu. ft. of cementitious material. (A bag of cement is considered as 1 cu. ft.)

PACKAGING:

50 lb. paper bags.

FREIGHT CLASSIFICATION:

Concrete or Masonry Plasticizer and Water Reducing Compound.

STANDARD SPECIFICATION:

Mortar for all masonry or plaster shall be composed of 1 part portland cement, 1 part lime putty and 6 parts sand (or as otherwise designated) to which shall be added *Omicron Mortarproofing* in the proportion of 1 pound per bag of portland cement (or masonry cement) and also 1 pound per cubic foot of hydrated lime or lime putty; the addition and mixing shall be in strict accordance with the directions of the manufacturer, The Master Builders Company.

Mortar for glass block shall consist of 1 part portland cement, ½ part hydrated lime or lime putty, 4½ parts well graded sand and 1 pound of *Omicron Mortarproofing* for each cubic foot of portland cement and lime in the batch.

DIRECTIONS:

Empty 1 or 2 bags of *OM* into a wood box and fluff it up with a rake or shovel. Use a clean, one-pound coffee can to proportion the *OM*.

When heaped full, a one-pound coffee can will hold 2 pounds of *OM*.

This amount of *OM* will treat 2 cubic feet of cementitious material; for example: one bag of cement, one bag of lime, 6 cubic feet of sand.

Note that the amount of mixing water required is substantially less than that for an untreated mortar of the same composition.

PRECAUTIONS:

1. *OM* is not soluble in water. It must be added to the mix in dry powder form.
2. Store and protect *OM* as you do cement.

REFERENCE SECTION

FREQUENTLY USED EQUIVALENTS

LINEAR MEASURE:

1 inch = 2.54 centimeters
1 foot = .305 meters
1 yard = .914 meters
1 mile = 5,280 feet
1,760 yards
1,609 meters
1.61 kilometers
1 centimeter = .394 inches
1 meter = 39.37 inches
3.28 feet
1.09 yards
1 kilometer = .621 miles

SQUARE MEASURE:

1 sq. inch = 6.45 sq. centimeters
1 sq. foot = 929 sq. centimeters
.093 sq. meters
1 sq. yard = .836 sq. meters
1 sq. meter = 1,550 sq. inches
10.76 sq. feet
1.20 sq. yards
1 acre = 43,560 sq. feet
4,840 sq. yards
4,047 sq. meters

VOLUME MEASURE:

1 cu. inch = 16.39 cu. centimeters
1 cu. foot = 1,728 cu. inches
1 cu. yard = 27 cu. feet
.765 cu. meters
1 cu. meter = 35.40 cu. feet
1.31 cu. yards
1 U.S. quart = .833 imperial quarts
.946 liters
57.75 cu. inches
1 imperial quart = 1.20 U.S. quarts
1.14 liters
69.32 cu. inches
1 liter = 1.06 U.S. quarts
.880 imperial quarts
61.02 cu. inches
1 U.S. gallon = 4 U.S. quarts
3.33 imperial quarts
.833 imperial gallons
3.78 liters
231 cu. inches
.134 cu. feet
1 imperial gallon = 4 imperial quarts
4.80 U.S. quarts
1.20 U.S. gallons
4.55 liters
277 cu. inches
.160 cu. feet

WEIGHTS:

1 ounce = 28.35 grams
1 grams = .035 ounces
1 lb. = .454 kilograms
1 kilogram = 2.21 lbs.
1 U.S. gallon of water = 8.35 lbs.
1 imperial gallon of water = 10 lbs.
1 cu. foot of water = 62.50 lbs.
1 bag cement (U.S.) = 94 lbs.
1 bag cement (Canada) = 87.50 lbs.
1 cu. foot cement (solid volume) = 196.56 lbs.

BUILDING MATERIAL WEIGHTS

MASONRY MATERIALS:

CEMENT (Masonry) ..... 70 to 85 lbs. per bag
SAND (Masonry) ..... 90 to 110 lbs. per cu. ft.; 2430 to 2970 lbs. per cu. yd.
HYDRATED LIME ..... 50 lbs. per bag; 40 lbs. per cu. ft.
LIME PUTTY ..... 80 lbs. per cu. ft.
MORTAR ..... 100 to 110 lbs. per cu. ft.

BRICK:
Common (2¼″ x 4″ x 8¼″) ..... 5.4 lbs. each; 2.7 tons per 1000
Fire (standard 9″ x 4½″ x 2½″) ..... 7.0 lbs. each; 3.5 tons per 1000
Hard (2¼″ x 4¼″ x 8½″) ..... 6.48 lbs. each; 3.24 tons per 1000
Paving (2¼″ x 4″ x 8½″) ..... 6.75 lbs. each; 3.37 tons per 1000
Paving Blocks (3¼″ x 4″ x 8½″) .... 8.75 lbs. each; 4.37 tons per 1000
Soft (2¼″ x 4″ x 8¼″) ..... 4.32 lbs. each; 2.6 tons per 1000

CONCRETE MATERIALS:

CEMENT (Portland) ..... 94 lbs. per U.S. bag; 376 lbs. per bbl.
WATER ..... 8.35 lbs. per U.S. gal.; 62.5 lbs. per cu. ft.
SAND (Dry) ..... 97 to 117 lbs. per cu. ft.; 2620 to 3160 lbs. per cu. yd.
GRAVEL ..... 95 lbs. per cu. ft.; 2565 lbs. per cu. yd.
CRUSHED STONE ..... 100 lbs. per cu. ft.; 2700 lbs. per cu. yd.
SLAG ..... 65 to 70 lbs. per cu. ft.; 1755 to 1890 lbs. per cu. yd.

CONCRETE:
Trap Rock Concrete ..... 150 to 155 lbs. per cu. ft.; 4050 to 4185 lbs. per cu. yd.
Limestone Concrete ..... 145 to 150 lbs. per cu. ft.; 3780 to 4050 lbs. per cu. yd.
Gravel Concrete ..... 145 to 150 lbs. per cu. ft.; 3780 to 4050 lbs. per cu. yd.
Slag Concrete ..... 130 to 140 lbs. per cu. ft.; 3510 to 3780 lbs. per cu. yd.
Lightweight Aggregate Concrete ..... 90 to 120 lbs. per cu. ft.; 2430 to 3240 lbs. per cu. yd.
Cinder Concrete ..... 85 to 110 lbs. per cu. ft.; 2295 to 2970 lbs. per cu. yd.

CONCRETE ESTIMATING TABLE

One Cubic Yard of Concrete Will Place:

Thickness	Sq. Ft.	Thickness	Sq. Ft.	Thickness	Sq. Ft.
1″	324	5″	65	9″	36
1¼″	259	5¼″	62	9¼″	35
1½″	216	5½″	59	9½″	34
1¾″	185	5¾″	56	9¾″	33
2″	162	6″	54	10″	32.5
2¼″	144	6¼″	52	10¼″	31.5
2½″	130	6½″	50	10½″	31
2¾″	118	6¾″	48	10¾″	30
3″	108	7″	46	11″	29.5
3¼″	100	7¼″	45	11¼″	29
3½″	93	7½″	43	11½″	28
3¾″	86	7¾″	42	11¾″	27.5
4″	81	8″	40	12″	27
4¼″	76	8¼″	39	15″	21.5
4½″	72	8½″	38	18″	18
4¾″	68	8¾″	37	24″	13.5

CLIMATOLOGICAL DATA FOR 24 CITIES IN THE UNITED STATES

Station	Precipitation		Wind		Mean Temperature		Number of Freezing and Thawing Cycles
	Annual Average	Maximum in 24 hours	Mean Hourly Velocity	Maximum	Daily Minimum	Daily Maximum	
	inches	inches	mph	mph	°F.	°F.	
Anchorage, Alaska	21.40	1.79	5.3	66	27.5	42.9	90
Baltimore, Maryland	44.92	7.62	9.9	72	48.0	64.0	58
Billings, Montana	17.96	2.83	11.1	73	35.5	58.6	91
Boston, Massachusetts	44.82	6.04	10.8	87	42.1	58.0	63
Butte, Montana	17.21	2.02	8.5	. . .	24.2	52.9	154
Chicago, Illinois	36.38	6.19	10.7	87	42.3	56.8	67
Cleveland, Ohio	37.96	4.97	13.1	78	39.2	58.2	67
Cordova, Alaska	105.81	7.92	3.9	. . .	29.5	45.5	119
Denver, Colorado	19.67	6.53	7.4	65	37.9	63.0	114
Des Moines, Iowa	35.06	5.37	9.9	72	40.3	59.7	75
Detroit, Michigan	35.68	4.75	10.6	95	40.9	56.8	66
Duluth, Minnesota	33.72	5.35	12.4	75	30.7	47.3	61
Helena, Montana	18.04	3.67	7.9	73	33.0	54.2	112
Indianapolis, Indiana	42.05	6.80	10.3	111	44.4	61.7	76
Milwaukee, Wisconsin	34.91	5.76	11.3	72	39.0	54.1	73
Minneapolis, Minnesota	31.12	7.80	11.2	92	36.0	53.9	64
New York, New York	47.09	3.44	13.0	59	28.4	41.5	49
Omaha, Nebraska	30.94	7.03	9.4	109	41.5	60.6	82
Philadelphia, Pennsylvania	43.67	5.89	10.2	88	47.0	62.7	76
Pittsburgh, Pennsylvania	39.68	4.08	10.4	73	43.6	61.5	69
Portland, Oregon	43.31	7.66	6.8	57	45.7	61.6	25
Seattle, Washington	34.59	3.52	8.9	63	45.3	58.8	23
Spokane, Washington	19.89	2.22	6.7	56	38.4	58.5	95
Washington, D.C.	44.15	7.31	7.1	62	46.7	64.8	55

PROPORTIONING TABLES

From "ACI Standard Recommended Practice for Selecting Proportions for Concrete" (ACI 613-54)

Recommended Slumps for Various Types of Construction*

Types of Construction	Slump, inches†	
	Maximum	Minimum
Reinforced foundation walls and footings	5	2
Plain footings, caissons, and substructure walls	4	1
Slabs, beams, and reinforced walls	6	3
Building columns	6	3
Pavements	3	2
Heavy mass construction	3	1

*Adapted from Table 4 of the 1940 Joint Committee Report on Recommended Practice and Standard Specifications for Concrete and Reinforced Concrete.

†When high-frequency vibrators are used, the values given should be reduced about one-third.

Maximum Sizes of Aggregate Recommended for Various Types of Construction

Minimum dimension of section, inches	Maximum size of aggregate*, inches			
	Reinforced walls, beams, and columns	Unreinforced walls	Heavily reinforced slabs	Lightly reinforced or unreinforced slabs
2½—5	½—¾	¾	¾—1	¾—1½
6—11	¾—1½	1½	1½	1½—3
12—29	1½—3	3	1½—3	3
30 or more	1½—3	6	1½—3	3—6

*Based on square openings.

Approximate Mixing Water Requirements for Different Slumps and Maximum Sizes of Aggregates*

Slump, inches	Water, gals. per cu. yd. of concrete for indicated maximum sizes of aggregate							
	⅜ in.	½ in.	¾ in.	1 in.	1½ in.	2 in.	3 in.	6 in.
Non-air-entrained concrete								
1 to 2	42	40	37	36	33	31	29	25
3 to 4	46	44	41	39	36	34	32	28
6 to 7	49	46	43	41	38	36	34	30
Approximate amount of entrapped air in non-air-entrained concrete, percent	3	2.5	2	1.5	1	0.5	0.3	0.2
Air-entrained concrete								
1 to 2	37	36	33	31	29	27	25	22
3 to 4	41	39	36	34	32	30	28	24
6 to 7	43	41	38	36	34	32	30	26
Recommended average total air content, percent	8	7	6	5	4.5	4	3.5	3

*These quantities of mixing water are for use in computing cement factors for trial batches. They are maxima for reasonably well-shaped angular coarse aggregates graded within limits of accepted specifications.

If more water is required than shown, the cement factor, estimated from these quantities, should be increased to maintain desired water-cement ratio, except as otherwise indicated by laboratory tests for strength.

If less water is required than shown, the cement factor, estimated from these quantities, should not be decreased except as indicated by laboratory tests for strength.

Maximum Permissible Water-Cement Ratios (Gals. Per Bag) for Different Types of Structures and Degrees of Exposure

Type of structure	Exposure conditions*	Severe wide range in temperature, or frequent alternations of freezing and thawing (air-entrained concrete only)			Mild temperature rarely below freezing, or rainy, or arid		
		In air	At the water line or within the range of fluctuating water level or spray.		In air	At the water line or within the range of fluctuating water level or spray	
			In fresh water	In sea water or in contact with sulfates†		In fresh water	In sea water or in contact with sulfates†
Thin sections, such as railings, curbs, sills, ledges, ornamental or architectural concrete, reinforced piles, pipe, and all sections with less than 1 in. concrete cover over reinforcing		5.5	5.0	4.5‡	6	5.5	4.5‡
Moderate sections, such as retaining walls, abutments, piers, girders, beams		6.0	5.5	5.0‡	§	6.0	5.0‡
Exterior portions of heavy (mass) sections		6.5	5.5	5.0‡	§	6.0	5.0‡
Concrete deposited by tremie under water		. .	5.0	5.0	.	5.0	5.0
Concrete slabs laid on the ground		6.0	. .	. .	§	. .	. .
Concrete protected from the weather, interiors of buildings, concrete below ground		§	. .	. .	§	. .	. .
Concrete which will later be protected by enclosure or backfill but which may be exposed to freezing and thawing for several years before such protection is offered		6.0	. .	. .	§	. .	. .

*Air-entrained concrete should be used under all conditions involving severe exposure and may be used under mild exposure conditions to improve workability of the mixture.

†Soil or ground water containing sulfate concentrations of more than 0.2 percent.

‡When sulfate resisting cement is used, maximum water-cement ratio may be increased by 0.5 gal. per bag.

§Water-cement ratio should be selected on basis of strength and workability requirements.

Compressive Strength of Concrete for Various Water-Cement Ratios*

Water-cement ratio, gals./sk.	by wt.	Probable compressive strength at 28 days, psi	
		Non-air-entrained concrete	Air-entrained concrete
4	.35	6000	4800
5	.44	5000	4000
6	.53	4000	3200
7	.62	3200	2600
8	.71	2500	2000
9	.80	2000	1600

*These average strengths are for concretes containing not more than the percentages of entraine an d/or entrapped air shown on page 156. For a constant water-cement ratio, the strength of the concrete is reduced as the air content is increased. For air contents higher than those listed on page 156, the strengths will be proportionally less than those listed in this table.

Strengths are based on 6x12 inch cylinders moist-cured under standard conditions for 28 days. See Method of Making and Curing Concrete Compression and Flexural Test Specimens in the Field (ASTM Designation: C 31.)

Volume of Coarse Aggregate per Unit of Volume of Concrete*

Maximum size of aggregate, inches	Volume of dry-rodded coarse aggregate per unit volume of concrete for different fineness moduli of sand			
	2.40	2.60	2.80	3.00
⅜	0.46	0.44	0.42	0.40
½	0.55	0.53	0.51	0.49
¾	0.65	0.63	0.61	0.59
1	0.70	0.68	0.66	0.64
1½	0.76	0.74	0.72	0.70
2	0.79	0.77	0.75	0.73
3	0.84	0.82	0.80	0.78
6	0.90	0.88	0.86	0.84

*Volumes are based on aggregates in dry-rodded condition as described in Method of Test for Unit Weight of Aggregate (ASTM Designation: C 29).

These volumes are selected from empirical relationships to produce concrete with a degree of workability suitable for usual reinforced construction. For less workable concrete such as required for concrete pavement construction they may be increased about 10 percent.

Recommended

CONCRETE CURING

Methods

PREPARED BY THE MASTER BUILDERS COMPANY
IN THE INTEREST OF BETTER CONCRETING PRACTICES

WHY CURING IS SO IMPORTANT

Tests show that improper curing can easily cut the strength of even the best concrete mix by 50%. Curing simply means keeping the water *in* the concrete where it can do its job of chemically combining with the cement and turning into a strong "glue" that will help make strong, durable concrete. Good curing means keeping the concrete damp and at about 70° until the concrete is strong enough to do its job . . .recommended practice calls for at least 7 days of curing.

All concrete must be cured to get the maximum strength of the concrete mix. Correctly cured concrete is best from every standpoint: it shrinks less, cracks less and dusts less. It's stronger, more durable and has a more wear-resistant surface.

Start curing the concrete as soon as possible after it has hardened. Once concrete has dried out—especially likely in hot, windy weather—curing cannot regain the strength lost.

Follow curing specifications carefully.

Poor curing can cut the strength of even the best concrete by 50%

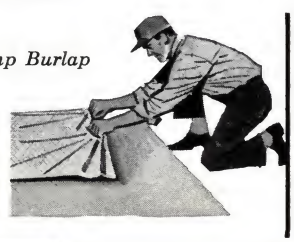
METHODS OF CURING

Water spray is a good curing method if the concrete is kept continuously damp. Don't allow the concrete surface to dry between sprinklings.

Waterproof paper holds moisture in the concrete by preventing evaporation. First, water spray the concrete surface, then cover with a non-staining waterproof paper. Overlap edges and seal with waterproof tape. This method works better for slabs than for walls or irregular surfaces.

Damp Burlap is effective and easy to handle. Spread burlap over the concrete surface and *keep damp* with water spray to replace water lost through evaporation.

Membrane Curing Compounds seal moisture in the concrete. Easy to spray or brush on. Low in cost and only one application needed. Effective for slabs, vertical walls or irregular surfaces. For flat work, cover the dried curing compound with scuff-proof building paper to protect the surface from marring by other trades until the curing is complete.



Damp Burlap

Waterproof Paper

Water Spray

Membrane Curing Compound

Other Methods include: *plastic sheets* which are completely watertight, light, easy to handle and give good protection during curing. *Earth, sand, straw and hay* are not recommended for a number of reasons: Earth and sand are messy and hard to handle. Straw and hay easily dry out, can blow away or burn.

CURE CONCRETE LONGER WHEN THE TEMPERATURE IS BELOW 70°

. . . because concrete strength develops more slowly at lower temperatures. Below 40° do *not* expect satisfactory performance from the concrete unless special precautions are taken. *Follow job specifications closely* on curing time. In the absence of specifications, concrete should be cured, protected from harmful temperatures and *not used* until it has developed the required strength. Ask your ready-mix concrete producer for special recommendations on hot or cold weather curing practices.

HERE ARE THE RESULTS OF GOOD CURING

More durable concrete: good concrete, properly cured, means fewer pores or cracks where water can enter, freeze, expand and crack the concrete. Air-entrainment helps make more durable concrete, but its use must be accompanied with proper curing.

More wear-resistant concrete: well cured concrete (28 day curing period) will give you a surface *twice as wear-resistant* as a surface that was cured for only 3 days. Proper curing prevents dusting.

and . . . proper curing means less cracking, crazing and spalling of the concrete. All in all—*the better the curing, the better your concrete.*

PROPORTIONING OF CONCRETE MIXES

Excerpts from "A Method of Proportioning Concrete for Strength, Workability, and Durability," by A. T. Goldbeck and J. E. Gray

Adequate but not extravagant strength, workability, and durability are the important qualities of most concretes. A remarkably simple method of proportioning which will produce the desired quality of concrete, irrespective of type or gradation of the aggregates, is here presented. It is founded on research, is easy to use, and is dependable and practical.

NON-AIR-ENTRAINING CONCRETE PROPORTIONING PROCEDURE:

1. USE OF TABULATED TEST VALUES:

From the relationships given in Tables 1 and 2, on the following pages, there is established:

a. The volume of coarse aggregate required per unit volume of concrete so that the concrete will be properly workable (b/b_o values from Table 1).

b. The cement factor and total water required per cubic yard of concrete for a given strength, slump, size, and type of coarse aggregate (data from Table 2).

2. TESTS ON THE PARTICULAR MATERIALS TO BE USED:

The following test values must be obtained on the particular materials to be used:

a. Bulk specific gravity of the coarse aggregate (ASTM C 127-42). These values are generally known for commercial aggregates.

b. Bulk specific gravity of the fine aggregate (ASTM C 128-42). These values are generally known for commercial aggregates.

c. Dry, rodded unit weight of coarse aggregate (ASTM C 29-42).

d. Gradation and fineness modulus of sand and gradation of coarse aggregate (ASTM C 136-46).

e. Assume specific gravity of cement equals 3.15 or determine the specific gravity.

3. PRELIMINARY CALCULATIONS AND DETERMINATIONS:

a. Calculate solid weights per cubic foot of the cement, of the coarse aggregate, and of the sand. (Bulk specific gravity multiplied by 62.4 lbs.)

b. Knowing the size of coarse aggregate and fineness modulus of sand, determine from Table 1 the proper value of b/b_o.

c. Calculate the solid volume of coarse aggregate per cubic foot of dry, rodded coarse aggregate (b_o).

$$b_o = \frac{\text{dry, rodded weight per cu. ft.}}{\text{solid weight per cu. ft.}}$$

d. Calculate $b = b/b_o \times b_o$.

e. Knowing the kind and size of coarse aggregate, and the 28-day strength and the slump of concrete desired, determine from Table 2 the cement factor and the water content.

f. Knowing the maximum size of coarse aggregate, select from Table 2 the percentage of entrapped air and calculate its solid volume per cubic yard of concrete:

Percent entrapped air x 27 ÷ 100 = cu. ft. per cu. yd. of concrete.

4. FINAL CALCULATIONS OF WEIGHTS OF MATERIALS REQUIRED PER CUBIC YARD OF CONCRETE:

a. Sum up the solid volumes of cement, coarse aggregate, water and air.

b. Twenty-seven cubic feet minus the solid volumes of cement, coarse aggregate, water, and air equals the solid volume of sand in a cubic yard of concrete.

c. Convert solid volumes of cement, sand, and coarse aggregate to weights using values calculated under item 3a above.

EXAMPLE OF METHOD OF PROPORTIONING:

It is required to determine the proportions of crushed stone concrete to have 3500 psi compressive strength at 28 days and 6 in. slump.

PRELIMINARY DETERMINATIONS:

Stone

Size, No. 4 to 1 in.		
Specific gravity		= 2.72
Solid weight, lbs. per cu. ft.	= 2.72x62.4	= 169.7
Dry, rodded weight, lbs. per cu. ft.		= 100.4
b_o	= 100.4/169.7	= 0.591

Sand

Specific gravity		= 2.63
Solid weight, lbs. per cu. ft.	= 2.63x62.4	= 164.1

Gradation:

Sieve Size	Total Retained, percent
3/8 in.	0
No. 4	1
No. 8	12
No. 16	27
No. 30	48
No. 50	72
No. 100	97

Fineness modulus = 2.57

PROPORTIONING OF CONCRETE MIXES

Cement

Specific gravity		= 3.15
Solid weight, lbs. per cu. ft.	= 3.15x62.4	= 196.6
Weight per bag, lbs.		= 94
Solid volume per bag.	= 94/196.6	= 0.48

CALCULATION OF PROPORTIONS:

From Table 1:

b/b_o for sand of 2.57 F.M. and No. 4 to 1 in. stone		= 0.69
$b = b/b_o \times b_o$	= 0.69x0.591	= 0.408

From Table 2:

Cement, bags per cu. yd.		= 5.6
Water, gals. per cu. yd.		= 40

	Solid Volume cu. ft. per cu. yd. of concrete						Quantities, lbs. per cu. yd. of concrete
Cement	5.6x0.48	=	2.69	x	196.6	=	529
Stone	0.408x27	=	11.02	x	169.7	=	1873
Water	40/7.5	=	5.33	x	62.4	=	333
Air	.015x27	=	0.40				
Total		=	19.44				
Sand	27—19.44	=	7.56	x	164.1	=	1241

CORRECTIONS FOR MOISTURE IN AGGREGATES:

The above are dry weights of sand and stone and therefore corrections in the proportions of sand, stone, and water must be made, depending on the moisture conditions of the aggregates on the job.

1. BOTH SAND AND COARSE AGGREGATE ARE DRY:

If the sand has an absorption at the end of 30 minutes in water of 0.5 percent, add 0.5 percent of 1241 lbs., or 6.2 lbs. to the weight of the mixing water, equivalent to 6.2/8.33 lbs. = 0.7 gals.

If the stone has an absorption of 0.3 percent at the end of 30 minutes, add 0.3 percent of 1873 lbs., or 6 lbs. to weight of the mixing water, or 0.7 gals. The total increase in mixing water is then 0.7 + 0.7 = 1.4 gals. per cu. yd. of concrete.

2. BOTH SAND AND COARSE AGGREGATE ARE WET:

If the above materials are both wet and have 3 percent of free water on the sand and 1 percent on the stone, and, in addition, 1 percent absorbed water in the sand and 0.5 percent in the stone, add 4.0 percent of 1241 lbs., or 50 lbs. to 1241 lbs., which equals 1291 lbs. of wet sand.

Due to 3 percent free water on the sand, the weight of mixing water must be decreased by 3 percent of 1241 lbs., or 37 lbs.

Due to 1 percent free water on the stone, in addition to its absorbed water of 0.5 percent, add 1.5 percent of 1873 lbs., or 28 lbs., to the

weight of stone, making the total weight of stone 1873 lbs. plus 28 lbs., or 1901 lbs.

Due to free water on the stone of 1 percent, the mixing water must be decreased by 1 percent of 1873 lbs., or 19 lbs.

The total gallons per cubic yard of mixing water, then, equals $40 - [(37 + 19)/8.33] = 40 - 7 = 33.0$ gals.

The batch weight of the materials and the unit weight of the concrete are as follows:

Cement		529 lbs. per cu. yd.
Stone	1873 + (1873 x .015)	1901 lbs. per cu. yd.
Sand	1241 + (1241 x .04)	1291 lbs. per cu. yd.
Water	33.0 x 8.33	275 lbs. per cu. yd.
Total		3996 lbs. per cu. yd.

The proportions thus obtained will give, very closely, the kind of concrete desired. The strength values tabulated in Table 2 are the minimum to be expected and the actual values obtained may range somewhat above these tabulated figures. Possibly slight adjustments in the field proportions will have to be made after the work has started, but if the preliminary determinations and calculations have been made correctly, these adjustments will be very small in amount.

AIR-ENTRAINING CONCRETE:

In designing air-entraining concrete, the procedure is to calculate the volume of coarse aggregate based on b/b_o values from Table 1 as previously described. From Table 3 are selected the cement factor, air content, and water content for a given strength, slump, and maximum size of coarse aggregate. The volume of sand per cubic yard of concrete is equal to 27 minus the sum of the volumes of coarse aggregate, cement, air, and water.

TABLE 1

For Structural Concrete, Placed Without Vibration
Dry, Rodded Volume (b/b_o) of Coarse Aggregate (Any Type) per Unit Volume of Concrete

Size of Coarse Aggregate, Square Opening Laboratory Sieves	Fine Sand		Medium Sand			Coarse Sand		
	Fineness Modulus of Sand							
	2.40	2.50	2.60	2.70	2.80	2.90	3.00	3.10
	Values for b/b_o							
No. 4 to ½ in.	.59	.58	.57	.56	.55	.54	.53	.52
No. 4 to ¾ in.	.66	.65	.64	.63	.62	.61	.60	.59
No. 4 to 1 in.	.71	.70	.69	.68	.67	.66	.65	.64
No. 4 to 1½ in.	.75	.74	.73	.72	.71	.70	.69	.68
No. 4 to 2 in.	.78	.77	.76	.75	.74	.73	.72	.71
No. 4 to 2½ in.	.80	.79	.78	.77	.76	.75	.74	.73

b solid volume of coarse aggregate per unit volume of concrete.
b_o solid volume of coarse aggregate per unit volume of coarse aggregate.
b/b_o dry, rodded volume of coarse aggregate per unit volume of concrete.

Note: For concrete which is to be assisted in place by internal vibration under very rigid inspection, increase tabulated values of b/b_o approximately 10 percent.

TABLE 2

Non-Air-Entraining Structural Concrete
Cement Factors (Bags per Cubic Yard of Concrete) Required for 28-Day Compressive Strengths Listed

Size of Coarse Aggregate, Square Opening Laboratory Sieves		No. 4 to ½ in.		No. 4 to ¾ in.		No. 4 to 1 in.		No. 4 to 1½ in.		No. 4 to 2 in.		No. 4 to 2½ in.	
Slump, inches		3	6	3	6	3	6	3	6	3	6	3	6
Water*, gals. per cu. yd. of concrete	Angular Coarse Aggregate	42	44	40	42	38	40	36	38	35	37	34	36
	Rounded Coarse Aggregate	38	40	36	38	34	36	32	34	31	33	30	32
28-Day Compressive Strength†, psi		Cement, bags per cubic yard of concrete											
2000		4.6	4.8	4.4	4.6	4.2	4.4	4.0	4.2	3.9	4.0	3.8	3.9
2500		5.0	5.2	4.8	5.0	4.5	4.8	4.2	4.5	4.1	4.3	4.0	4.2
3000		5.4	5.7	5.2	5.4	4.9	5.2	4.6	4.9	4.4	4.7	4.3	4.6
3500		5.9	6.3	5.6	5.9	5.3	5.6	5.0	5.3	4.9	5.2	4.8	5.0
4000		6.5	6.9	6.2	6.5	5.8	6.2	5.5	5.8	5.4	5.7	5.2	5.5
4500		7.2	7.5	6.8	7.1	6.4	6.8	6.1	6.4	5.9	6.3	5.7	6.1
5000		8.1	8.5	7.7	8.1	7.3	7.7	6.9	7.3	6.7	7.1	6.5	6.9
Entrapped Air, approximate percent		2.5		2		1.5		1		1		1	

*This is the water actually effective as mixing water. See example on page 125 for method of taking into account free water on wet aggregates and absorption of dry aggregates.

†The 28-day compressive strengths shown are the minimum values to be expected and should be used for design purposes. Laboratory specimens cured under ideal conditions will generally have higher strengths.

NOTE: For concrete to be assisted in place by internal vibration, use 3 inch slump and decrease tabulated water contents by approximately 4 gals. No reduction in cement factor is suggested.

TABLE 3

Air-Entraining Structural Concrete
Cement Factors (Bags per Cubic Yard of Concrete) Required for 28-Day Compressive Strengths Listed

This Table Should Always be Used to proportion Concrete to be Subjected to Freezing

Size of Coarse Aggregate, Square Opening Laboratory Sieves		No. 4 to ½ in.		No. 4 to ¾ in.		No. 4 to 1 in.		No. 4 to 1½ in.		No. 4 to 2 in.		No. 4 to 2½ in.	
Slump, inches		3	6	3	6	3	6	3	6	3	6	3	6
Water*, gals. per cu. yd. of concrete	Angular Coarse Aggregate	38	40	36	38	34	36	32	34	31	33	30	32
	Rounded Coarse Aggregate	35	37	33	35	31	33	29	31	28	30	27	29
28-Day Compressive Strength†, psi		Cement, bags per cubic yard of concrete											
2000		4.4	4.7	4.2	4.4	3.9	4.2	3.7	3.9	3.6	3.8	3.5	3.7
2500		4.9	5.2	4.6	4.9	4.4	4.7	4.2	4.4	4.0	4.3	3.9	4.2
3000		5.6	5.9	5.3	5.6	5.0	5.3	4.7	5.0	4.5	4.8	4.3	4.7
3500		6.3	6.7	6.0	6.3	5.6	6.0	5.3	5.6	5.1	5.4	4.9	5.3
4000		7.2	7.5	6.8	7.2	6.4	6.8	6.0	6.4	5.8	6.2	5.6	6.0
4500		8.1	8.5	7.6	8.1	7.2	7.6	6.8	7.2	6.6	7.0	6.4	6.8
5000		9.2	9.7	8.7	9.2	8.2	8.7	7.7	8.2	7.4	8.0	7.2	7.7
Optimum Entrained Air Content‡, percent		6.0		6.0		5.5		5.0		5.0		4.5	

*This is the water actually effective as mixing water.

†The 28-day compressive strengths shown are the minimum values to be expected and should be used for design purposes. Laboratory specimens cured under ideal conditions will generally have higher strengths.

‡This optimum entrained air content provides for approximately 9 percent air in the mortar.

WATER TABLE

(Solid volume and weight of various quantities of water)

U.S. gals.	Solid Vol. (cu. ft.)	Weight (lbs.)
0.1	0.013	0.83
0.2	0.027	1.66
0.3	0.040	2.50
0.4	0.053	3.33
0.5	0.066	4.16
0.6	0.080	5.00
0.7	0.093	5.83
0.8	0.106	6.66
0.9	0.120	7.50
1.0	0.133	8.33
20	2.67	166.7
21	2.80	175.0
22	2.93	183.3
23	3.07	191.7
24	3.20	200.0
25	3.33	208.3
26	3.47	216.7
27	3.60	225.0
28	3.73	233.3
29	3.87	241.7
30	4.00	250.0
31	4.13	258.3
32	4.27	266.7
33	4.40	275.0
34	4.53	283.3
35	4.67	291.7
36	4.80	300.0
37	4.93	308.3
38	5.07	316.7
39	5.20	325.0
40	5.33	333.3
41	5.47	341.7
42	5.60	350.0
43	5.73	358.3
44	5.87	366.7
45	6.00	375.0
46	6.13	383.3
47	6.27	391.7
48	6.40	400.0
49	6.53	408.3
50	6.67	416.7
51	6.80	425.0

AGGREGATE TABLE

(Solid weight of aggregates of various specific gravities.)

SP. GR.	SOLID WT. CU. FT.	SP. GR.	SOLID WT. CU. FT.
2.20	137.2	2.56	159.7
2.21	137.9	2.57	160.3
2.22	138.5	2.58	160.9
2.23	139.1	2.59	161.6
2.24	139.7	2.60	162.2
2.25	140.4	2.61	162.8
2.26	141.0	2.62	163.4
2.27	141.6	2.63	164.1
2.28	142.2	2.64	164.7
2.29	142.8	2.65	165.3
2.30	143.5	2.66	165.9
2.31	144.1	2.67	166.6
2.32	144.7	2.68	167.2
2.33	145.3	2.69	167.8
2.34	146.0	2.70	168.5
2.35	146.6	2.71	169.1
2.36	147.2	2.72	169.7
2.37	147.8	2.73	170.3
2.38	148.5	2.74	170.9
2.39	149.1	2.75	171.6
2.40	149.7	2.76	172.2
2.41	150.3	2.77	172.8
2.42	151.0	2.78	173.4
2.43	151.6	2.79	174.0
2.44	152.2	2.80	174.7
2.45	152.8	2.81	175.3
2.46	153.5	2.82	175.9
2.47	154.1	2.83	176.5
2.48	154.7	2.84	177.2
2.49	155.3	2.85	177.8
2.50	156.0	2.86	178.4
2.51	156.6	2.87	179.0
2.52	157.2	2.88	179.7
2.53	157.9	2.89	180.3
2.54	158.5	2.90	180.9
2.55	159.1		

CEMENT TABLE

(Solid volume of various quantities of portland cement)

LBS.	BAGS	CU./FT. (Solid Vol.)	LBS	BAGS	CU./FT. (Solid Vol.)
282	3	1.44	475	5.05	2.42
287	3.05	1.46	479	5.1	2.45
291	3.1	1.49	484	5.15	2.47
296	3.15	1.51	489	5.2	2.50
301	3.2	1.54	494	5.25	2.52
306	3.25	1.56	498	5.3	2.54
310	3.3	1.58	403	5.35	2.57
315	3.35	1.61	508	5.4	2.59
320	3.4	1.63	512	5.45	2.62
324	3.45	1.66	517	5.5	2.64
329	3.5	1.68	522	5.55	2.66
334	3.55	1.70	526	5.6	2.69
338	3.6	1.73	531	5.65	2.71
343	3.65	1.75	536	5.7	2.74
348	3.7	1.78	541	5.75	2.76
353	3.75	1.80	545	5.8	2.78
357	3.8	1.82	550	5.85	2.81
362	3.85	1.85	555	5.9	2.83
367	3.9	1.87	559	5.95	2.86
371	3.95	1.90	564	6	2.88
376	4	1.92	569	6.05	2.90
381	4.05	1.94	573	6.1	2.93
385	4.1	1.97	578	6.15	2.95
390	4.15	1.99	583	6.2	2.98
395	4.2	2.02	588	6.25	3.00
400	4.25	2.04	592	6.3	3.03
404	4.3	2.06	597	6.35	3.05
409	4.35	2.09	602	6.4	3.07
414	4.4	2.11	606	6.45	3.10
418	4.45	2.14	611	6.5	3.12
423	4.5	2.16	616	6.55	3.15
428	4.55	2.18	620	6.6	3.17
432	4.6	2.21	625	6.65	3.19
437	4.65	2.23	630	6.7	3.22
442	4.7	2.26	635	6.75	3.24
447	4.75	2.28	639	6.8	3.27
451	4.8	2.30	644	6.85	3.29
456	4.85	2.33	649	6.9	3.31
461	4.9	2.35	653	6.95	3.34
465	4.95	2.38	658	7	3.36
470	5	2.40			

COLD WEATHER CONCRETING

(Master Builders Technical Bulletin No. 15)

The setting and hydration of portland cement or concrete mixes is a chemical function. The rapidity with which this chemical change, which is commonly called setting and hardening, takes place depends largely upon the temperature of the mixture. An increase in curing temperature within limits causes more rapid hydration and correspondingly higher rate of gain in strength.

Concrete placed in wooden forms or in large masses, at temperatures higher than surrounding air, will hydrate and gain strength faster than concrete placed in thin sections such as exposed slabs.

Liberation of heat of hydration due to hydration of mixtures containing portland cement at 70° temperature does not become pronounced until after about three hours' time. (Journal American Concrete Institute, Nov., 1940—"The Effect of Various Reagents on the Heat Liberation Characteristics of Portland Cement," by L. R. Forbrich.) At a temperature of 50° heat of hydration does not become pronounced for approximately 12 hours or longer. Therefore, at low temperatures the heat of hydration of portland cement cannot be depended upon to accelerate the chemical reaction of hydration.

One of the most important problems confronting the construction industry in cold weather is the production of satisfactory floor slabs. With cold exposure of the fresh concrete on floor slabs, two very important problems are posed. They are:

1. Securing a satisfactory wear-resisting finish which is hampered by the bleeding of water out of the concrete, followed by drying out of the surface of the slab which has not hydrated.

2. The high cost of finishing which is involved due to the slow setting and hardening of the slab.

With respect to finishing concrete slabs exposed to cold weather, one very important item to take full recognition of is the difference in temperature of the wet bulb thermometer vs. dry bulb thermometer. For example, the following chart gives a general idea of this variation:

Thermometer Reading (Degrees F.)		Humidity %
Dry	Wet	
50	50	100
50	49	94
50	48	87
50	47	82
50	46	74
50	45	68
50	44	62
50	43	56
50	42	50

From the preceding chart it will be noted that if, for example, a slab is laid and the temperature of the air and the concrete is 50°F (dry bulb), and the humidity is 50%, with a breeze blowing over the surface of the concrete, the temperature of the surface of the concrete would be depressed by the rapid evaporation of moisture to 42°F (wet bulb).

A plain concrete mix having a temperature of 40 to 45°, poured in a slab and being exposed to an air temperature of 40 to 45°, will hydrate very slowly, the actual rate of hydration being dependent largely upon the type and brand of cement and the water-cement ratio employed. Such concrete will usually bleed excessively before hydration takes place. This bleeding causes a consolidation of the heavier constituents in a concrete mix. Such bleeding usually takes place relatively rapidly (within the first few hours after the concrete has been placed). If the water which has bled out of the slab is drained off or removed with a hose or some absorptive method, the slab has sufficient consolidation generally to work on it and effect at least a floating operation and sometimes a steel trowelling.

If air-entrainment is employed, profuse bleeding such as is encountered in a similar conventional plain mix will not be experienced, at least not to the same extent.

The air-entrained mix, due to the lack of profuse bleeding, will not consolidate in the same manner as plain concrete, and therefore, due to lack of compaction or consolidation the air-entrained slab cannot be worked on for floating and trowelling as quickly as the plain slab. This is due to lack of rigidity of the mass.

At normal temperatures of approximately 70° the differential between the plain and the air-entrained slabs is minor. This is due to the fact that in both cases hydration takes place so quickly that the actual amount of water bleeding out in proportion to the total water in the slabs is not at such great variance as to cause any great differential in the rigidity of the concrete. At low temperatures, the time element before chemical reaction or hydration takes place is so great that the differential in the relation of the water bled off from the plain vs. that bled off from the air-entrained mix produces a marked difference in the rigidity of the concrete.

Heating the concrete so that it is placed at temperatures of 70 to 80° is very helpful especially if additional protection and heat is supplied for the concrete after is has been placed, particularly in slab work. However, it is important to bear in mind that thin slabs lose their heat very rapidly if exposed to low temperatures especially with a wind blowing over them. As an example, on a recent job which was observed, concrete placed in an 8″ slab at 70° and exposed to an air temperature of 40° at a velocity of 10 miles per hour, relative humidity of 70%, had a temperature of 60° one hour after being placed.

The addition of calicum chloride, in the amount of 1 to 2% of the weight of the cement in concrete mixes having 3 to 5% of entrained air, will usually

expedite the hydration to such an extent that the rigidity of the concrete clab will be comparable to a plain concrete mix at temperatures below 50°F. Sometimes with a strictly normal Type I cement no noticeable difference is observed between a plain mix and an air-entrained mix at low temperatures, even without the addition of calcium chloride. This, of course, is due to the fast hydration characteristics of some brands of Type I cement.

DO'S and DON'TS:

Following are a few of the "do's" and "don'ts" to be observed in connection with cold weather concreting, particularly finished slab work:

DO:

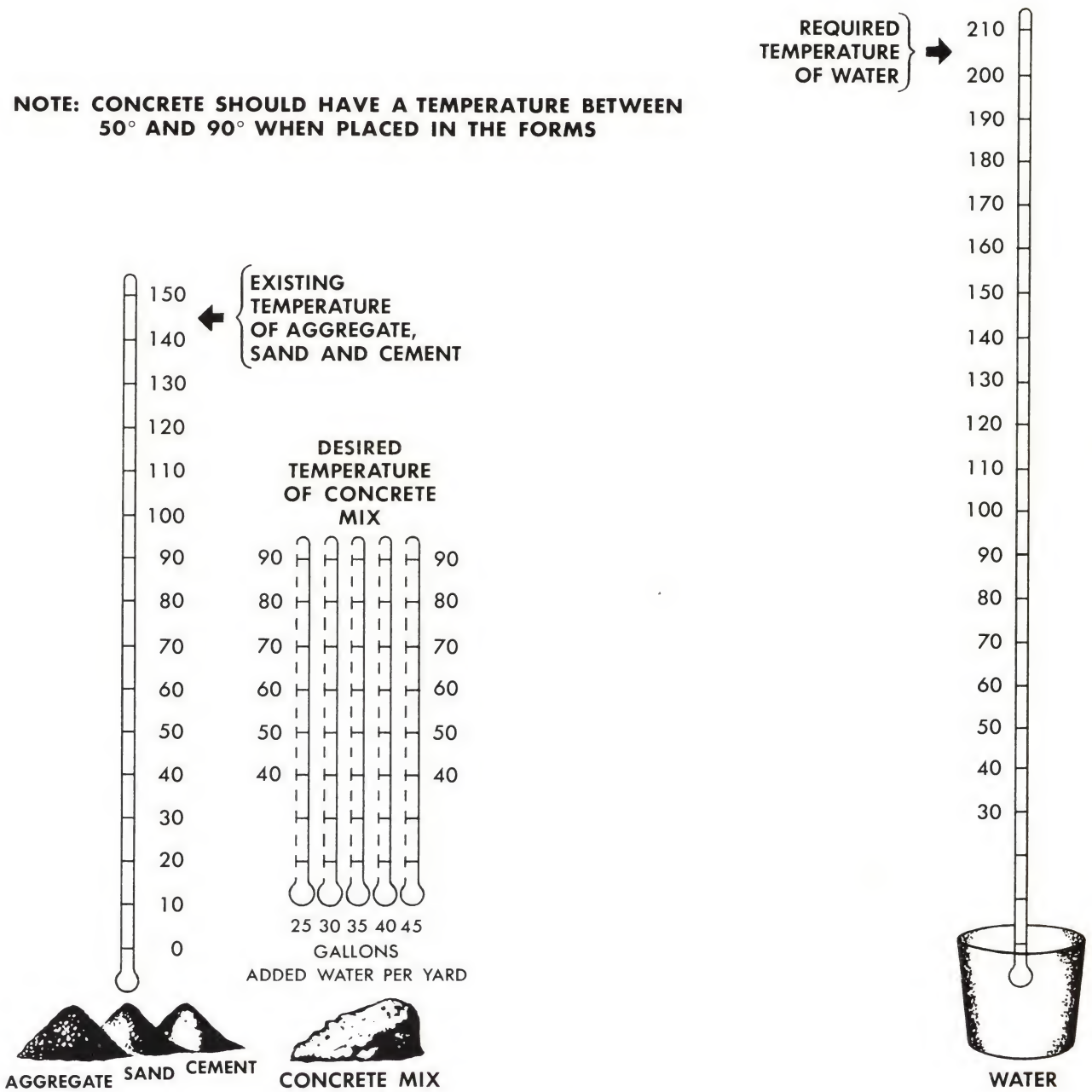
1. Furnish concrete heated 70 to 90° if possible.
2. Provide enclosure and heat if possible if temperature is below 50°.
3. Screed slab to level and avoid any additional manipulation until in condition for next operation.
4. Float slab when possible to work on without sinking in.
5. Close surface with a steel trowel when slab has stiffened to the degree that it will not bring excessive amounts of moisture to the surface.
6. Give following trowellings and burnishings when slab has set to the proper degree.
7. Apply curing membrane or curing protection as soon as convenient after finished trowelling.

DON'T:

1. Do not expect concrete containing entrained air to be finish trowelled in the same time as a plain concrete slab under similar conditions, unless either additional heat is employed or an accelerator (calcium chloride) is used. This is due to the water retaining features normal to all air-entrained concrete mixes.
2. Air-entrained concrete slabs should not be over manipulated in the finishing operations. Screed the slab to level after placing the concrete. When excess water and sheen have disappeared from the surface, float to remove any irregularities on the surface. Allow floated surface to remain without further manipulation until the surface appears dull and is ready for steel trowelling. Further trowellings should be given only when the slab is ready to receive them. Avoid over manipulation.
3. At below 50° when applying metallic aggregate, slip-resistant aggregate, etc., by the dust-coat method, additional care is advisable to make sure the floating and steel trowelling are done at the proper time as described above. The practice occasionally used of applying dust-coats of portland cement and sand to facilitate finishing, is not helpful or desirable on properly designed air-entraining concrete mixes. At below 50° such dust-coats tend to hold moisture in the slab and may cause more difficult finishing.

TEMPERATURE CONTROL CHART FOR CONCRETE MIXES

NOTE: CONCRETE SHOULD HAVE A TEMPERATURE BETWEEN 50° AND 90° WHEN PLACED IN THE FORMS



HOW TO USE CHART

1. Place a straightedge across one of the center thermometers, at the desired temperature of the concrete mix, using the thermometer which shows the number of gallons of water to be added to the mix, as follows:

(a) If sand is surface dry, use the solid line on the body of the thermometer as the pivot point.

(b) If sand contains 3% moisture, use dotted line on the body of the thermometer as the pivot point.

2. Pivot the straightedge at this point, swinging the left end of the straightedge to the existing temperature of the aggregate, sand and cement, shown on the thermometer at the left.

3. Read the required temperature of the water on the thermometer at the right, at the point where the straightedge crosses the thermometer.

VOLUME CHANGE IN CONCRETE

Particularly as it Pertains to Floor Slabs and Topping

(Master Builders Technical Bulletin No. 6)

Volume change and cracking are attributable to numerous causes. They are:

1. Heat of Hydration
2. Amount of Mixing Water
3. Varying Temperatures
4. Alternate Wetting and Drying
5. Strength
6. Extensibility

HEAT OF HYDRATION:

The amount and rate of heat of hydration evolved in laying a floor slab or topping is important because upon cooling, it causes shrinkage forces in the slab or topping. These forces are frequently of such a sudden nature and occur prior to the time the concrete has acquired any great strength to resist such forces resulting in incipient cracks. These minute cracks formed in this manner, later on open wider and form large cracks when other factors cause further internal stress in the concrete.

Factors affecting amount and rate of heat of hydration are:

a. Type of cement used. Type I — Normal Portland Cement; Type II — Moderate Heat of Hydration Cement; and Type III—High Early Cement; are the three types of cement most usually employed. The amount and rate of heat evolved is greatest with the High Early type of cement and least with the Moderate Heat of Hydration type.

In order to minimize cracking from thermal stresses caused by heat of hydration, it is necessary to control the temperature of the concrete materials so that when hydration occurs, the concrete has the temperature desired for curing under existing conditions.

b. Amount of cement in the mix. Cement is the constituent which liberates heat upon hydration and, therefore, the lower the amount in the mix, the smaller the amount of heat generated.

c. Addition of accelerators, such as calcium chloride, expedites the hydration of cement and, therefore, increases the amount of heat evolved during the early hardening period.

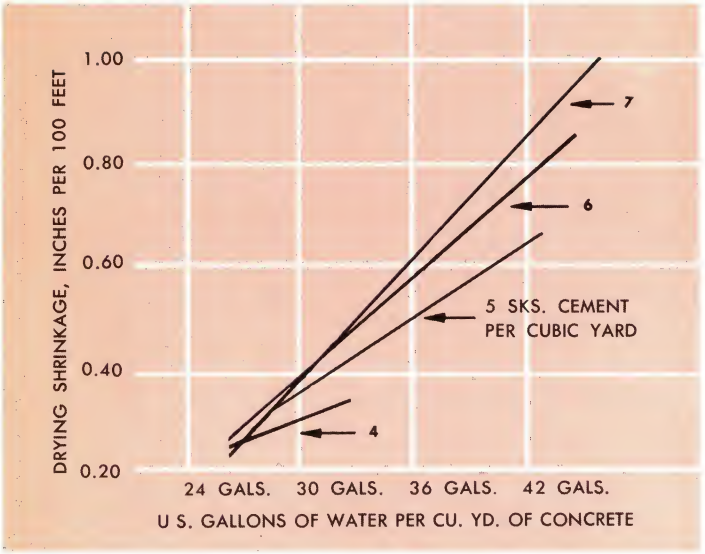
d. Other factors which are important in conjunction with heat of hydration are: type and character of aggregate; thickness of slab; steel reinforcement. (Bureau of Reclamation Manual, Sixth Ed., page 18, par. 1.)

AMOUNT OF MIXING WATER:

The amount of water used per cubic yard is undoubtedly by far the most important single factor contributing to volume change and cracking of concrete floors. (R. W. Carlson, "Drying Shrinkage of Concrete as Affected by Many Factors," A.S.T.M. Proc. 1938, Part II, pages 419-440.)

VOLUME CHANGE IN CONCRETE

The relationship between drying shrinkage and unit water content of the fresh concrete is also shown in the chart on the following page, taken from data in the U. S. Bureau of Reclamation Concrete Manual, 6th Edition, page 17.



After curing a floor slab, it is vitally important that the concrete dry out gradually, not rapidly. Drying the concrete gradually allows plastic flow and extensibility to compensate for the stresses caused by volume change. Rapid drying of the concrete does not allow these characteristics to come into play.

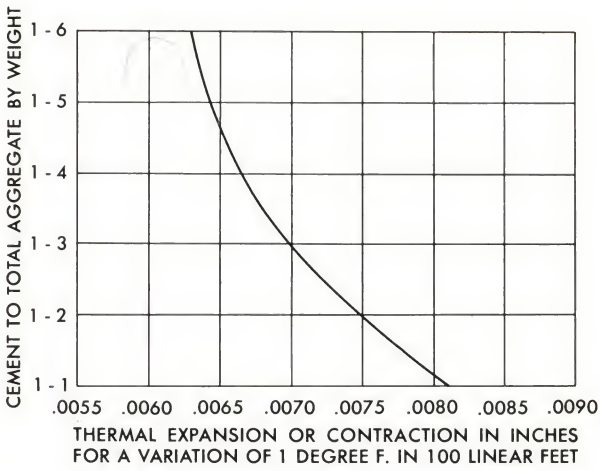
VARYING TEMPERATURES:

Variations in temperature changes the volume of the concrete, as shown in chart below. Normal temperature changes which are not of a particularly rapid nature generally do not harm concrete floor slabs which have set, hardened and been cured. Sudden, or large temperature changes do have a deleterious effect on slabs which have set and acquired no great degree of hardness or slabs which are restrained so that they cannot adjust themselves to the new volume.

ALTERNATE WETTING AND DRYING:

Hardened concrete increases in volume when it absorbs water and shrinks when it dries. Alternate wetting and drying of concrete which causes expansion and contraction will eventually affect the stability of the cement paste and tend to break the bond with the aggregate. This will result in checking, cracking and gradual disintegration of the floor slab. (Bureau of Reclamation Manual, Sixth Ed., page 15.)

VOLUME CHANGE IN CONCRETE



STRENGTH:

Before a floor slab is subjected to internal strains induced by drying shrinkage, alternate wetting and drying or rapid changes of temperature, it should be cured and protected so that it will have developed a large percentage of its potential strength. Floor slabs rarely crack due to compressive stresses induced in the concrete. Most cracks occur due to tensile stresses. A floor slab may be of such magnitude, accompanied by large volume change, that even though unrestrained otherwise, it develops tensile stresses within itself which exceed the tensile strength of the slab. In this case, cracks develop. A slab laid on a rough dense soil or rock would have considerable external restraint and in spite of reasonably close contraction joints, the stresses developed by such external restraint may exceed the tensile strength of the concrete resulting in small closely spaced cracks. On a graded, level sand subgrade, external restraint will not be high, and a properly designed and cured slab will have a minimum of cracks.

EXTENSIBILITY:

This is the ability of the concrete subjected to tensile stresses to change in volume without cracking due to its tensile strength, elastic and plastic flow characteristics.

A floor slab properly cured so that it has developed relatively high tensile strength, not under exterior restraint, and protected in such a manner that it will not dry out rapidly, will develop a minimum of cracks. When internal stresses are applied gradually to concrete, plastic flow, elasticity and tensile strength will resist such stresses to a much greater extent than sudden loads or shocks. (Bureau of Reclamation Manual, Sixth Ed., page 28, par. (b).)

CONCLUSIONS:

1. Design a suitable concrete mix with the lowest possible amount of water per unit mass of concrete placeable under existing job conditions.

2. Take precautions to prevent putting floor slab under exterior restraint, unnecessarily.

3. Provide contraction joints at suitable spacing depending upon thickness and strength of slab. The three details of construction and contraction joints, in the following illustrations, are designed to minimize fractures and surface chipping when impact or stress is applied at the joint.

4. Cure slab sufficiently, depending on temperature, to develop designed strength.

5. Cure with suitable membrane waterproofing or other means so that moisture loss after curing period is gradual. Underside of slab is just as important as surface.

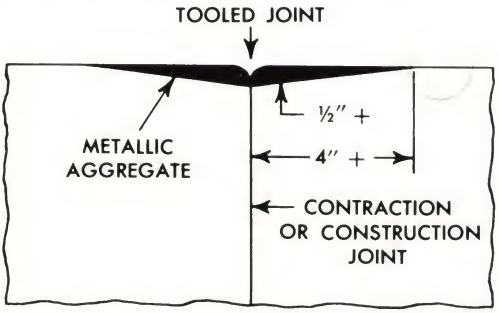
6. Do not subject concrete slab to sudden changes of temperature, especially in early stages.

7. For most work expansion joints are not too significant. Contraction joints are imperative. Spacing of contraction joints depends upon thickness, strength, volume changes of concrete employed as well as external restraining influences.

8. The value of using an expanding metallic aggregate integrally in a topping mix is definitely indicated. The use of such expanding type aggregate used in proper proportions will assist in relieving contraction stresses and, therefore, preserve greater extent of bond to the slab.

9. Inasmuch as a floor slab loses water more rapidly from its surface than any other portion, contraction forces are greatest at that point. This tends to warp the slab and cause cracks. The use of metallic dust-coats which oxidize and expand slightly will assist in alleviating this condition. The dust-coats of metallic hardeners will also serve to reduce contraction stresses on the surface by substantially reducing the amount of water per unit mass of the concrete.

DETAIL AND DESCRIPTION OF PROTECTION OF THE SURFACE AT JOINTS:



The concrete is floated down about ½" on both sides of the joint and tapered back 4" to floor level. This depressed area is filled with a mortar using *Masterplate* and portland cement proportioned same as for the dust coat application. After floating, a tooled joint is formed on the line of the joint.

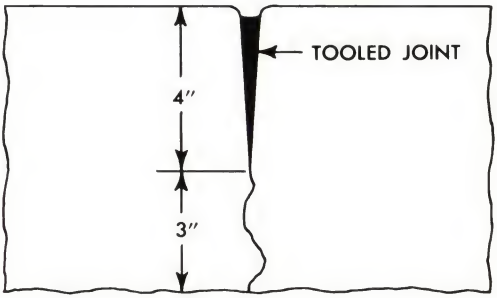
The above operation must be performed while the concrete is in a plastic state.

Purpose is to provide greater thickness of ductile aggregate at joints to better withstand impact.

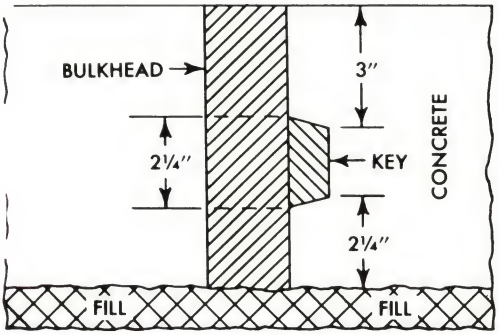
DETAIL AND DESCRIPTION OF "CUT" CONTRACTION JOINT:

Joint is cut in concrete where required with tool steel joint cutter BEFORE CONCRETE STARTS TO SET. This forms a straight line of weakness to which contraction is confined.

The joint is cut to a depth somewhat greater than half the thickness of the slab. The irregular break that occurs below the joint acts as a key.



DETAIL AND DESCRIPTION OF CONSTRUCTION JOINT FOR SEVEN-INCH CONCRETE SLAB:



The bulkhead should be so constructed that there will be more concrete in shear at the top of the slab than at the base of the key or the bottom of the slab. In this example there is about 3" from the key to the top against about 2¼" at the key and bottom of slab. The purpose of this is that in case of unusual impact or excessive loading at one side of the joint such that some failure occurs, the fracture will tend to be at the key or bottom of the slab, and not at the surface.

CONCRETE SUBJECT TO ACID CONDITIONS

(Master Builders Technical Bulletin No. 8)

Portland cement dissolves rapidly and completely in strong acids; it is readily attacked by dilute acids. Consequently, portland cement concrete will disintegrate more or less rapidly in contact with strong or moderate acids, regardless of the quality of the concrete. While improvement of the quality of the concrete by one means or another will perhaps reduce the rate of attack, this reduction is insignificant where moderate to strong acid conditions are involved.

Concrete should ordinarily not be used under acid conditions, which rapidly attack portland cement. No Master Builders product should be recommended as a protection against attack under such conditions. A partial list (taken from Appendix I, Report of the Joint Committee on Standard Specifications for Concrete and Reinforced Concrete, ACI 1940) of reagents in this category is:

Sulphuric Acid	Nitric Acid	Sulphurous Acid
Hydrochloric Acid	Acid Sulphates	Hydrofluoric Acid
	Nitrates of Ammonia	

Sulphates of Aluminum, Iron, Manganese, Cobalt and Nickel

Where, for one reason or another, concrete is to be used under these conditions, the surface of the concrete must be protected from contact with the acid. No thin coating affords sufficient protection and no Master Builders product can be recommended for this purpose.

Where corrosive conditions are less severe, adequate protection may be afforded either by improving the quality of the concrete itself or by a surface treatment. The former is preferable, as surface treatments are generally unreliable. Master Builders products which are useful under these conditions are *Pozzolith** and *Masterplate**.

1. *POZZOLITH*—Corrosion-resistance of concrete is improved by *Pozzolith,* as has been described elsewhere, by reduction of the water-cement ratio and reduction of permeability. It is effective against sea water, sulphate solutions (non-acid) of moderate concentrations, and mild acids (pH above 3.0).

2. *MASTERPLATE*—Floors subject to corrosive conditions are improved in resistance by *Masterplate* because of decreased permeability, decreased exposure of cement to attack, and increased wear-resistance. Specific corrosive conditions against which *Masterplate* is effective have been set forth in previous bulletins. *Masterplate* should not be recommended under corrosive conditions unless experimental data relating to that specific condition are available.

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CONCRETE SUBJECT TO ACID CONDITIONS

It should be noted that alkalies, neutral salt solutions except sulphates, and neutral organic compounds do not ordinarily attack portland cement concrete.

Under certain conditions of concentration and wetting and drying, soluble neutral and alkaline substances may cause disintegration, especially in porous concrete due to crystal pressure. This condition is, however, relatively rare.

POZZOLITH TEST DATA:

Data on some acid sulphate corrosion tests of *Pozzolith* concrete, with the same and with decreased cement factors, in comparison with plain and Vinsol resin concretes, are given below.

Specimens, three from each mix, made with *Pozzolith,* Vinsol resin, and no admixture were immersed for one year in a solution of sodium sulphate maintained at a pH of approximately 3.0 by additions of sulphuric acid.

The mix data are:

Addition	C.F. Bags/cu.yd.	W/C Gals/bag	Water Gals/cu.yd.	Slump In.	Strength †
None	5.29	7.50	39.6	3¼	4650
Vinsol resin .01%	5.28	7.16	37.8	3	4500
Pozzolith	5.29	6.85	36.2	3¾	5320
Pozzolith	4.52	7.80	35.2	3¼	4740

†Compressive strength; 28 days—lbs./sq.in.

Results of the corrosion tests are:

Mix	Percent Expansion		
	2 months	6 months	12 months
Plain	.05	.36	1.70
Vinsol resin	.07	.18	.66
Pozzolith—Same C.F.	.03	.16	.37
Pozzolith—Reduced C.F.	.05	.13	.28

At the end of one year the plain concrete specimens were badly cracked at one end, the bottom. All other specimens showed some cracking at the bottom end. The order of appearance was the same as the order of decreasing expansion.

CONCRETE SUBJECT TO ACID CONDITIONS

ACID-PROOF COATINGS FOR CONCRETE SURFACES

(Excerpts from U.S. Bureau of Standards publication.)

Four methods of treatment have been used for the protection of concrete floors, vats, tanks, reservoirs and other concrete surfaces against mineral acids and acid salts. The methods selected depend upon the character of surface to be covered, the concentration and temperature of the acid, whether the coating is required to resist abrasion, and cost. The materials are bituminous compositions of various kinds.

BITUMINOUS PAINTS:

Bituminous paints are used chiefly on account of their cheapness and ease of application and when properly applied have given fair protection against mineral acids and acid fumes of low concentrations, when not subjected to abrasion. They have been satisfactorily used on the walls of rooms and fume ducts and on tanks or other vessels with smooth walls such as are obtained with a plaster or grout coat. Two kinds are marketed; those made with an asphalt and those with a coal tar pitch base, thinned to the desired brushing consistency with suitable volatile solvents For very dilute mineral acids, paints made from either base are suitable, but asphalt paints appear to be somewhat more resistant than the coal tar paints against acids stronger than 10 percent. Asbestos fiber is sometimes added in order to increase the thickness of coating obtained.

Bituminous paints will not resist abrasion and their effectiveness depends upon the thickness and imperviousness of the dried coating. Portland cement is very susceptible to acid of any strength, and consequently any pin holes due to faulty application or any abrasion in the surface will be sufficient to destroy the protection afforded by the coating. Once the acid penetrates the paint coating it will readily soak into and disintegrate the concrete beneath and cause the paint coating to form blisters which will ultimately flake off.

The most satisfactory method of applying bituminous paints is to use a thin priming coat to fill up the surface pores and thus obtain a good bond with the concrete surface, and when this is thoroughly dry, to apply carefully at least two coats of a thicker material of the same character or containing asbestos fiber, allowing sufficient time for the first coat to dry before the application of the second. The primer can be made by thinning the thicker material with a suitable volatile solvent. (A petroleum distillate such as mineral spirits or turpentine substitute is generally used for asphaltic paints, and coal tar distillates as solvent naphtha for the coal tar paints.) It is important that the concrete surface be thoroughly dry and fairly dust free. Special care should also be taken to touch up and recoat all dull, brown, porous and uncoated spots. At least one week should elapse after the application of the last coat of paint before exposure to the acid.

CONCRETE SUBJECT TO ACID CONDITIONS

BITUMINOUS ENAMELS:

The bituminous enamels are used where protection for fairly long periods against relatively strong acids is desired, and when the cost of the structure justifies the extra expense of application. They can be employed both on smooth and rough walls and surfaces, and on account of the thickness of the coat used an impervious coating is more easily obtained. They will not resist abrasion at elevated temperatures.

The bituminous enamel consists of two materials, the priming solution and the enamel proper. The priming solution consists of a bituminous material (either asphalt or coal tar pitch) with a melting point sufficiently high to resist flow at the maximum temperature of service, and of low susceptibility to temperature changes, dissolved in sufficient volatile solvent to give a paint of thin brushing consistency. The enamel proper consists of a bituminous material similar to that used in the primer, with or without a finely powdered siliceous mineral filler. Although enamels are made without mineral filler, some mineral filler is regarded as desirable, as it increases the resistance of the enamel to flowing and sagging at elevated temperatures and to abrasion. The enamel is applied hot over the properly dried priming coat.

APPLICATION:

Extreme care should be taken in the application of these materials so as to obtain a continuous coat free from blisters and pin holes, and bonding well to the surface. The concrete surface should be as dry as possible, and free from oil and grease and all loose particles and dust. The primer then should be applied and should be worked thoroughly into all hollows and pores. As the bond between the concrete surface and the enamel coat depends to a great extent upon the proper application of the primer, before the application of the enamel, the primed surface should be thoroughly inspected and all brown, dull, or uncoated spots should be touched up. When the primer has dried to a slightly tacky state, it is ready for the enamel.

The enamel should be melted and carefully heated until it is sufficiently fluid for brushing, avoiding decomposition and carbonization. The temperature of the material in the kettle should not exceed 218°C (425°F). When fluid it should be mopped on quickly, as it sets and hardens very rapidly.

Note: For structures below ground or those in which the temperature never exceeds 38°C (100°F), material melting at a lower temperature and made from a softer bituminous material may be used on account of its greater ease of application.

ACID-PROOF ASPHALT MASTICS:

Acid-proof asphalt mastics have been used extensively for floors and have given very satisfactory service in a wide variety of chemical and dye manufacturing plants, metal pickling, plating, acid tank, and storage battery rooms, the pulp rooms of paper mills, in copper, gold, lead, and

other similar refineries, and in laboratories. Although used to some extent in the past in tanks, vats, and reservoirs for acids and acid liquors, this use for acid-proof asphalt mastic has developed greatly recently, owing to the very satisfactory behavior of the material when exposed to acid conditions. In several copper refineries mastic has even been used for making pipes for carrying the acid liquors.

Acid-proof asphalt mastics are somewhat similar to the mixtures used in the construction of bituminous concrete, except that they contain a little more asphaltic cement, so that when hot and ready to lay they can be poured and are sufficiently plastic to be trowelled into place by wooden floats or light tamping irons. When mixed and ready for laying, they usually consist of about 10 to 15 percent by weight of asphaltic cement, approximately 20 percent by weight of finely powdered siliceous mineral filler passing a No. 200 sieve, and the remainder properly graded sand or other acid-resisting aggregate retained on a No. 200 sieve and containing no particles larger than those passing a No. 3 sieve. The asphaltic cement usually has a melting point of 60° to 99° C (140° to 210°F), depending upon the conditions of service of the finished mastic, and may be composed either of fluxed natural asphalts or properly prepared oil asphalts. The proper grading of the aggregate so as to get a mixture of maximum density is important, as upon it the stability and efficiency of the finished mastic largely depends.

The asphalt cement and finely powdered mineral matter can be mixed together directly on the job or they can be mixed by the manufacturer at his plant and shipped to the job in blocks or cakes called "mastic blocks" or "mastic cakes." The use of mastic block is most common and is to be preferred. On very large jobs, however, it may be more economical to incorporate the fine mineral filler directly at the site of the work. In that case, although not absolutely necessary, instead of an iron kettle with hand stirring, it is better to use a rotary mastic machine, preferably of a type in which the products of combustion do not enter the mixing drum. With a machine of this type there is less danger of burning and overheating the mastic.

Mastic blocks consist of a mixture of asphalt cement of a definite melting point and consistency combined with the finely powdered mineral matter and sometimes part of the coarser aggregate. As much asphalt as possible is incorporated in the block without interfering with the shipping qualities of the latter. The blocks should not stick together nor lose their shape during shipment. Mastic block contains from 12 to 18 percent of asphalt by weight, from 40 to 60 percent by weight of siliceous dust passing a No. 200 sieve and the remainder sand coarser than a No. 200 sieve but passing a No. 3 sieve. It comes to the market in square, octagonal, circular, etc., shaped blocks or cakes weighing from 50 to 90 lbs. each.

In the laying of mastic, asphaltic materials called fluxes are used for tempering or increasing the asphalt content of the mixture. The fluxes are

usually designated as "hard and soft fluxes." The "hard fluxes" are used for raising the melting point of the asphalt cement in the mastic, and the so-called soft fluxes for increasing the asphalt content without necessarily changing the melting point of the asphalt cement present. The "hard flux" generally is straight refined Trinidad asphalt, highly blown petroleum asphalt, fluxed grahamite, or wurtzelite pitch with a melting point (Ring and Ball Method) of approximately 93°C (200°F). The "soft flux" usually is fluxed Trinidad or low melting petroleum asphalt similar to the asphalt used in the mastic block. Occasionally "fluxes" melting at temperatures below 60°C (140°F), between 71 to 82°C (160 to 180°F), and even as high as 138°C (280°F) are used for special purposes.

For use the blocks are broken up and placed in a mastic kettle or the drum of a mastic machine. Sufficient "hard or soft flux" is added to meet the particular conditions of the job, and the mixture is heated and stirred or mixed until the block is entirely disintegrated and the mass is homogeneous. The mineral aggregate is then added and the mass heated at approximately 218°C (425°F) with stirring until the mixture is homogeneous and sufficiently fluid for pouring.

Mastic is most effective when applied at least one inch thick. For flooring, when more than one inch is required, the mastic is laid in two courses of approximately equal thickness with staggered joints. In special instances wire mesh or expanded metal is used for reinforcing, especially in tank work where there are vertical surfaces. For tank work the mastic is usually cast in a special form.

ACID-PROOF ASPHALT COMPOSITIONS FOR COLD APPLICATION:

Acid-proof asphalt flooring compositions for cold application are sometimes improperly referred to by the term mastic or mastic flooring because they are used like true mastic for floors. The term mastic, however, is very definite and is properly applied to those bituminous mixtures containing mineral filler and coarse sand or fine gravel which, when sufficiently heated, melt to a thick fluid mass that can be poured into place and can be spread and compacted by hand with wooden trowels, floats, or light rollers.

Acid-proof asphalt flooring compositions for cold application are of trowelling consistency and consist essentially of a relatively hard asphalt, asbestos fiber, and finely powdered siliceous mineral filler, thinned with a volatile solvent. When the solvent evaporates, a very thin coherent coat of the intimately mixed asphalt and mineral matter is left behind. Acid-proof asphalt flooring compositions are used chiefly where a thin surfacing for concrete floors is desired, as in laboratories which do not have to withstand any traffic heavier than walking. The black composition is most resistant to acid but where appearance is of importance, red, brown, and olive green are sometimes used. In that case only the top two or three coats of composition contain pigment.

In general four different compositions are used in applying these coatings: (1) primer, (2) body coat, (3) neat or finishing coat, and (4) floor dressing.

The primer consists of about three parts of asphalt dissolved in seven parts of a volatile solvent. It is of fairly thin consistency and dries to a tacky state in from one-half to 3 hours in which condition it is suitable for the application of the succeeding coats. The asphalt used in the primer is similar to that used in the body coat and finishing coat and has a melting point (Ring and Ball Method) of 88 to 116°C (190 to 240°F) and a penetration at 25°C (77°F), 100 g, 5 sec., of about 10.

The body coat is always black in color, is of heavy trowelling consistency, and dries hard in from 12 to 48 hours. It consists of asphalt, asbestos fiber, small amounts of fine siliceous mineral matter, and a suitable volatile solvent.

For colors other than black a composition called the first colored top coat is used directly on top of the body coat and before the application of the neat or finishing coat. It dries hard in about the same time as the body coat and consists of asphalt, asbestos fiber, pigment and volatile solvent.

The neat or finishing coat may be black, red, olive green or brown. It usually contains no asbestos. The black composition consists of asphalt, fine siliceous material and solvent. The colored compositions contain pigments instead of part or all of the fine siliceous material.

The floor dressing is a very thin liquid of a varnish-like character and is applied like a varnish or floor dressing over the completed floor.

CONCRETE FLOORS

METALLIC AGGREGATE DUST-COATS WITH AIR-ENTRAINED CONCRETE

(Master Builders Technical Bulletin No. 16)

Air-entrained concrete, whether produced through the use of interground air-entraining cement or by the addition of an air-entraining admixture, requires special control of the air content if it is to be used in finished floors.

Too high air content in the concrete frequently will produce a very rubbery condition which is difficult to finish to a level, smooth surface. High air contents preclude necessary bleeding of sufficient magnitude to allow easy finishing. Unusually high amounts of air may separate from the mix and become entrapped in the form of bubbles below the surface being finished. These bubbles not only prevent trowelling the floor to a level surface but also can produce blisters which are vulnerable spots to traffic such as trucking and lead to early disintegration of the floor. High air contents markedly reduce strength and make the floors less resistant to wear.

Regardless of the air-entraining agent used to produce air in the mix, it is necessary for the best results to limit the air content to not more than 4%. Use of an interground air-entraining cement for concrete for floors is not recommended because it is difficult to control the air content to keep it below the allowable maximum of 4% and preferably 3% maximum.

As with a plain concrete floor, after placing the concrete and screeding the floor to level, it should be allowed to remain undisturbed until stiff enough to float—either by hand with wood floats or by mechanical floats. The floor surface should then receive no further working until all sheen has disappeared and stiffness has reached the point that a flat steel trowelling can be made without bringing an appreciable amount of moisture to the surface. After the initial trowelling the slab should be allowed to remain without further manipulation until ready for final trowelling and then burnishing.

In applying metallic aggregate dust-coats to concrete slabs containing air-entraining agents, it is highly important to make certain that they are thoroughly incorporated into the surface of the slab. This is more difficult than with plain concrete mixes because of the lack of water gain on the surface of the slab. If thorough incorporation is not effected, scaling of the dust-coat may result later on. Cement-sand dust-coats occasionally needed on plain floors to facilitate finishing are not needed on air-entrained concrete which has been properly designed.

*Masterplate**, can be successfully incorporated in the surface of an air-entrained concrete slab, if the above timing is followed and care is taken to make certain that it is thoroughly worked into the surface of the slab, and if the air content does not exceed the maximum limit given above. The use of normal non-air-entraining cement mixed with the *Masterplate* for the dust-coat will greatly assist in incorporating it into the air-entrained concrete slab. *Masterplate* with normal portland cement may be used as the dust-coat with concrete temperatures maintained above 50°F. Below 50°F, finishing presents many difficulties and requires special measures.

SUMMARY:

When dust-coats of any nature are applied to air-entrained concrete slabs, precautions should be observed as follows:

1. Regulate air contents to not more than 4%.

2. Set screed strips in such a manner that slab can be bridged with planks. This permits earliest possible application of the dust-coat without having to wait for the concrete to stiffen.

3. Screed and float or darby to level. Apply dust-coat immediately. Do not manipulate further until the concrete has stiffened somewhat.

4. Float a second time and allow to remain until steel trowelling doesn't bring excessive moisture to the surface.

5. Flat trowel. Do not overwork or close the surface at this time.

6. Final trowel when blisters will not occur beneath the surface. Burnish if desired.